

KUNGL. SVENSKA VETENSKAPSAKADEMIENS HANDLINGAR. Band 40. N:o 5.

CONTRIBUTIONS

TO

THE FAUNA OF SOUTH GEORGIA

I.

TAXONOMIC AND BIOLOGICAL NOTES ON VERTEBRATES

BY

EINAR LÖNNBERG

WITH 12 PLATES AND 7 FIGURES IN THE TEXT

READ MARCH 17TH, 1906

UPPSALA & STOCKHOLM
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Although the island South Georgia is said to have been discovered and even named before, its history of investigation rightly dates from 1775 when COOK rediscovered it and gave it the name under which it has from that time been known. Messrs FORSTER, father and son, and Dr. SPARRMAN, who accompanied COOK, gave also the first notes concerning the animal and plant life of this island. The animal life was certainly then very much richer than it is now, but the whole island seemed to SPARRMAN so barren and dreary that he wrote in his diary — »this island (31 Leagues long and 10 broad and of less value than the smallest farm in England) was called Georgia». — — — —

After COOK the sealers came who from 1800 and onward searched the island for fur-seal which they exterminated and in return gave — rats.

VON BELLINGHAUSEN made in the year 1819 a new map of the island.

WEDDELL widened in the year 1823 the knowledge about the fauna of antarctic regions inclusive South Georgia.

Then followed a long period during which the island seemed to be forgotten except by sealers and whalers who now and then made, or tried to make a raid on the unfortunate fur-seals, which, however, had rapidly diminished and soon disappeared, the »sea-elephant» had then to pay a heavy tribute of blubber to defray the costs.

KLUTSCHAK accompanied 1877—78 a vessel due on such errands, and after his return to Europe communicated some notes about South Georgia (1881).

In the years 1882—83 a great German Expedition stayed on the island about a year and made thorough researches in the dominions of different sciences. Thanks to this expedition we have a fair idea about the climatic conditions of this island as good as it can be from observations during one year. Zoological and botanical collections and biological observations were made as well.

During the first part of the antarctic winter 1902 the Swedish Antarctic Expedition visited South Georgia and made very valuable zoological collections. When this expedition had returned to Europe Captain C. A. LARSEN determined to establish a whaling station on South Georgia as he, during his repeated voyages in antarctic waters, had come to the conclusion that such an establishment with modern

equipment of the kind invented and used in Norway for the whaling industry should prove to be profitable. When the present author received information about this Captain LARSEN's plan he asked for permission to send a collector with him to South Georgia. Captain LARSEN kindly assented to this, and Mr. ERIK SÖRLING, Assistant taxidermist at the Swedish Natural History Museum in Stockholm was allowed to accompany him on his expedition. In consequence of the fact that the enterprise was just about to be started and had economic, not scientific aims the accommodations for scientific collecting could not always be so very comfortably arranged, but Captain LARSEN kindly afforded all the help he, under the prevailing circumstances, was able to give. For this kindness and for all favours bestowed upon SÖRLING during his stay at South Georgia from the middle of Nov. 1904 to the end of Sept. 1905 as well as for the keen interest Captain LARSEN always has taken in scientific researches I wish to render him here publicly my best thanks on behalf of the institution I have the honour of administering, and at the same time personally as a friend.

During Captain C. A. LARSEN's absence from June 1 t. 1905 his brother Captain L. E. LARSEN conducted the business at the factory and he showed the same kindness and readiness to assist as his brother, and therefore to him as well warm thanks are due for what he has done for the promotion of SÖRLING's work.

I wish however, in the first place, to recognize with full appreciation the work done by SÖRLING himself. The preparation of a whale skeleton is certainly a heavy task and he has prepared three such, prepared skins and skeletons of big Elephant-seals, of Leopard-seals and Weddel-seals, preserved skins and skeletons of a fair collection of birds, preserved some fishes etc. In addition to this he found time to collect some eggs and chicks, and to prepare a valuable embryological material of penguins for my friend Professor ERIK MÜLLER, and to make a small collection of invertebrates. If to this is added that everything which he has carried home proves that the work has been done with great care, I think, that it must be admitted that he has acquitted himself of his charge in a way that deserves full approval.

The following paper contains a treatise on the vertebrate fauna of South Georgia based on the collections and the interesting field-notes made by SÖRLING. In a later paper the osteology of the whales and other results of his expedition will be published.

Before the account about the animals is begun it may be suitable to make some previous remarks about the natural conditions of this island.

Concerning the climate my friend Professor H. E. HAMBERG has kindly favoured me with the following abstract: »The climate of South Georgia (54° 31' S. lat.; 36° 5' W. long.) is in its leading features known chiefly through the researches of the German Expedition at its station in Royal Bay on the northeastern coast of the island during the time Sept. 15th 1882—Sept. 3d 1883. Observations and notes concerning the weather were also made by Captain LARSEN and Mr. E. SÖRLING in Cumberland Bay during the months Jan.—Aug. 1905.»

»The atmospheric pressure at the sea level is, as a rule, rather low although not so low as in the true antarctic regions. Its mean height may be about 745 mm.»

It varies, however, very much. Within 24 hour, the 19th of April 1883 a change of the barometrical height of not less than 42,1 mm. was observed. On the northern hemisphere Iceland alone might be able to show changes of similar size».

»The mean temperature of the year Sept. 1882—Aug. 1883 was only + 1,7° C. If this can be regarded as being about equal to the normal condition the mean temperature would be about 4 degrees lower than the comparatively not very far distant and on about the same latitude situated Cape Horn, the southern point of South America, and about 6 degrees lower than for instance on Rugen, but 3 degrees higher than in Nikolajevsk at the Sea of Okhotsk on corresponding latitude on the northern hemisphere. The warmest month is February and it had they ear mentioned a mean temperature of + 5,4° C., or about the same as the corresponding summer month July of normal years on Southern Spitzbergen. During the coldest month, June, the mean temperature was — 2,9° C. or rather similar to that of the corresponding winter month in Stockholm. The lowest temperature observed by the German Expedition was — 12,3° C. in July, the highest in the shade according to the same authority + 17,8° C. in February. Mr SÖRLING never stated himself any lower temperature than — 11° C. (the 10th of July 1905), and the highest degrees observed by him which, however, appear to have been somewhat disturbed by direct insolation exceeded sometimes + 20° C. Even during the summer months, December—February, the thermometer fell sometimes to about zero of the centigrade, but very seldom below. From these facts may be concluded that the climate of South Georgia with regard to the extremes of the temperature is rather limited as also could be expected that it should be on an island in an ocean which never is frozen. The occasional changes of the temperature are, however, rather considerable and in the middle of the winter the temperature sometimes rises several degrees above zero, — the 28th of Aug. (corresponding to February of the northern hemisphere) 1883 at 9 o'clock p. m. + 15,1° C. was observed during a western »föhnwind».

»The average for the accumulation of clouds was the year quoted 7,1 (according to the rule: 0 = clear to 10 = fully overclouded) and it was rather similar during all the months of the year. The number of clear days (that is with the sky less overcast than degree 2 of the scale) was only 6, mostly during the winter. The number of cloudy days (the sky more overcast than degree 8 of the scale) was 129, 72 of which fell on the spring and summer. Fog was observed 74 days.»

»The quantity of rain and snow was estimated to 988 mm. One day, the 7th of Aug. 1883, the considerable quantity of 75,5 mm. was measured. The measuring of the fallen snow was often made difficult by snow-storms. Thunder was not observed. The number of days with rain or snow was 301, and snow fell 223 days 47 of which belonged to the summer. The quantity of snow is probably very different winters. During Mr. SÖRLING's stay on the island during the winter 1905 the ground round Cumberland Bay was always covered with snow and during the year 1882 the quantity of snow was considerable but during the winter 1883 the ground was often bare, a fact which the members of the expedition put in connection with the prevail-

ing strong but mild western »föhn»-winds.¹ »On the southwestern coast of the island the ground might be covered with snow the whole year, and the glaciers are there greater and the temperature lower.»

»Westerly winds prevail and the strength of the wind is usually great, storms occurring very often.»

It is evident that the terrestrial organic life cannot be very rich in such a climate. The German Expedition found 13 species of phanerogamous plants and the Swedish Expedition added two more species to that number. The botanist of the latter expedition Dr. C. SKOTTSBERG has given a short but very characteristic sketch of the land and its flora² from which may be quoted some passages. »South Georgia is a very high ridge, rising very steeply out of the ocean. The mountains, in general highly inaccessible, rise to heights of more than 6,000 feet. Great masses of ice occupy vast areas; mighty glaciers open out into the fiords, and hanging glaciers are often met with a short distance from the coast. Glacier rivers and brooks from perpetual snowfields are to be found every where, exercising a great influence on the distribution of plants. The lowland occupies a very small area, and is broken by steep ridges into narrow valleys, opening on a level beach covered by sand and pebbles. On these shores and these valleys we find the vegetation of South Georgia. Besides that, the coast is extremely steep, having a very poor vegetation.» The most characteristic plant is the tussock-grass (*Poa cæspitosa*) which on favourable places »reaches a height of 3 to 5 feet», and is not only confined to the coast land and the glens but extends up on the surrounding mountains to an altitude of 800 950 feet. It avoids moist ground. Where the tussock does not grow and it is not too wet *Phleum alpinum* and *Festuca erecta* form meadows. In moister places *Aira antarctica* »is an important component.» Two species of *Acæna* are found in different localities and constitute with their red flowerheads the most conspicuous elements among the flowering plants of this island. Four species of ferns only are known, but the mosses are very plentiful. SKOTTSBERG estimates their number of species to 78, many of these as well as of the liverworts being endemic. »Mosses and lichens play a very important part in the meadows», SKOTTSBERG says, and on the mountains they become more and more dominating, and above 1500 feet they alone represent the plant life.

The vegetation of the sea is by far richer than that of the land. The giant *Macrocystis* forms a dense submarine forest along the coast and »amongst the kelp live a lot of different algæ, both brown, red and green» — — —.

The fauna is still more exclusively bound to the sea than the flora. There is no endemic terrestrial mammal but a rat has accidentally been introduced by man. The mammals of the South Georgian fauna are marine, and if they go ashore, as the seals do, it is only to rest or for breeding purposes. The sea furnishes them with all their food. And so it does more or less directly with the birds, as well, at

¹ In May 1902 the Swedish Expedition found the land round Cumberland Bay almost free from snow but when it left the ground was covered by more than 3 feet of snow.

² The Geographic Journal Vol. XX, p. 498. London 1902.

least, during the winter. Even if the pipit and the teal during the summer find food enough on land and in the fresh water, the winter forces them down to the shore or even out on the floating kelp. Only one species of bird appears to be migratory and that is the rapacious and parasitic Great skua, which chiefly preys on the eggs and young of the other true seabirds.

The sea is »teeming with fish» and the invertebrate fauna is also exceedingly rich at least in individuals. The pelagic fauna shows an abundance of »kril» (Euphausiids) which constitutes the main food for whales, many birds and fishes. As the sea never is frozen, and its inhabitants find practically similar conditions all the year round it could be assumed that the fauna would be identical summer and winter. But such is not the case. Some of the whales migrate during the winter but some seals arrive from the south to pass the winter at South Georgia.

Although the conditions of life appear to be very uniform and simple on and at this oceanic island, there are many biological problems to study and to solve, although a good deal has been done from the time of the German Expedition and to the present day.

But since the days of the discovery much has been changed to the worse. That ugly spook »Extermination» which always sneaks at the discoverers heels has heavily touched this poor land. The fur-seal which a little more than a hundred years ago crowded the beaches of South Georgia is wholly extinct through the greediness of man. The beautiful king-penguin, the stately appearance of which gladdened the discoverers, is highly reduced in number and threatened to its existence. Who dares to foretell how long the harmless monsters, the Elephant-seals, may be allowed to remain in one of their last refuges?

It is to be hoped that the rightful owner of the island may regulate by legislation how heavily the animal life may be taxed and then vindicate the law, thus affording protection to the beings which are most exposed to the danger of being destroyed.

Above all, wanton destruction should be strictly forbidden and heavily punished. For it has been witnessed how, by the crew of an Argentine vessel, merely for »fun's» sake Elephant-seals have been shot and killed only to be left to rot on the beach, or wounded taken their refuge to the sea only to miserably die afterwards. And likewise it has been witnessed how a crowd of ruffians have broken off the wings of penguins and then let them loose to see how they behaved. To such barbarisms there ought to be put an end, not only in the name of science but in the name of humanity.

Mammals.

The fauna of South Georgia included originally only seals and whales, but after the discovery through the agency of man, a rat has been introduced.

Three species of seals have been known to inhabit the coasts of South Georgia. One of them, the only representative of Eared Seals, Otariidæ, is now, as it seems, wiped out of existence as far as South Georgia is concerned. On the other hand SÖRLING has found that one antarctic species, Weddells' seal, during the winter in a small number visits these shores and that there, is a probability that even another, the Crabeater (*Lobodon*), occasionally finds its way there although this was not fully ascertained. The geographical distribution of these seals is so well known that it need not to be discussed here. The only species with distinct northern affinities is of course the member of *Cystophorinae*, *Mirounga* which is now circumpolar in the subantarctic region but the ancestors of which wandered south along the west-coast of the American continents.

The knowledge about the whales of the southern hemisphere has unfortunately been very scanty to the present day, and as far as the antarctic and subantarctic regions are concerned it is chiefly confined to the observations and narratives of different expeditions which have navigated in these waters. This material has been collected, discussed and criticised by RACOVITZA (18) in a very valuable manner and published together with his own observations. From all this the evidence has been received that several different species of whales inhabit the Antarctic sea and it has even been made probable that these whales belong to certain genera and species, but proofs of full taxonomic value were hitherto wanting. In the following treatise the present author is able to give the first definite report about the whales inhabiting the waters of South Georgia. Four species of whalebone-whales are to be found there, and these constitute southern parallels to the Nordcaper, the Humpback, the Blue whale and the Finback of the Northern Atlantic. Although the account about these species could have been desired to be more complete, certainly the knowledge about the southern whales is considerably increased, and, I hope, it will be still more furthered when the osteology of the species is worked out as I trust soon shall be the case.

Seals.

? *Arctocephalus australis* (ZIMMERMANN) 1782.

The Furseal appears to be fully extinct now on South Georgia. The latest news are wholly negative. A Chilenian sailing vessel visited the coasts of this island 1905 and its crew spied in every corner and cove all round the island, to detect a fur-seal, but in vain, the last of this unfortunate tribe is already slaughtered in this region.

In former days they were very numerous and at the rediscovery of the island in Jan. 1775 it is reported that the coast swarmed with nursing females and their young calves. But the happy days were now past. Sealing vessels soon appeared on the scene. »In the year 1800 the South Georgian rookeries were attacked and speedily exhausted», Dr J. A. ALLEN says in his interesting report about »Furseal hunting in the Southern Hemisphere.»¹ According to the same authority² in a single season 1800—1801 not less than 112,000 skins were taken, and in a few years 1,200,000 fur-seals were killed there. 1822 there seemed as if none was left. The hunting was not profitable and ceased so that the seals could increase a little. 1874 1,450 skins were taken and the following year 600. In the year 1892 135 fur-seals were killed and they may have been the very last ones.

Mirounga leonina (LINNÉ) 1758.

Syn: *Phoca Leonina* LINNÉ 1758.

» *Elephantina* MOLINA 1782.

» *proboscidea* PÉRON & LESUEUR 1816.

Macrorhinus F. CUVIER 1826.³

Mirounga Ansonii GRAY 1827.

Cystophora proboscidea NILSSON 1837.

¹ »The Fur Seals and Fur Seal Islands of the North Pacific Ocean» by D. S. JORDAN etc. Part. 3 Washington 1899. p. 207.

² l. c. p. 314.

³ *Macrorhinus* is the generic name which is most generally used for this animal, and F. CUVIER is quoted as author of the same. So is for instance the case in TROUËSSART's valuable »Catalogus Mammalium and its »Quinquennale Supplementum.» As a fact F. CUVIER used the name »Macrorhine» in Mém. Mus. d'Hist. Nat. Paris, XI, 1824, but he did not publish the name with the latin spelling »*Macrorhinus*» earlier than in the year 1826 in Dict. Sc. Nat. t. 39. In the meantime LATREILLE had named a genus of Coleoptera *Macrorhinus* in the year 1825. *Macrorhinus* F. CUVIER 1826 was thus preoccupied, as the word »Macrorhine» cannot be interpreted but as a french »*nomen triviale*» for the Sea-Elephant. In such a case and according to the generally accepted international rules of nomenclature there is no other way out of the difficulties than to accept the next name which happens to be GRAY's peculiar *Mirounga*, and, although it seems deplorable, I have found myself obliged to such a proceeding.

- young (skin etc.) Boiler Harbour, Cumberland Bay, the 25th of Dec. 1904.
 young (skull) the same locality, the 24th of Dec. 1904.
 young (skin etc.) Moraine Fjord, Cumberland Bay, the 1t of Jan. 1905.
 ad. (skin etc.) the same locality, the 26th of Febr. 1905.
 ad. (skull) the same locality, the 27th of Febr. 1905.
 ad. (skin etc.) Cumberland Bay, the 9th of June 1905.
 ad. (skeleton) the same locality and date.
 ad. (skull) » » » » »
 ad. (skull) Moraine Fjord, Cumberland Bay, the 7th of June 1905.
 ad. (skull) South Fjord Cumberland Bay, the 30th of Aug. 1905.
 ad. (skull) the same locality and date.
 ad. (skull) Moraine Fjord, Cumberland Bay, the 31 of Aug. 1905.

The discoverers of South Georgia called these animals »Sea-lions» but added that it was the kind described by Lord ANSON and this proves that it really was ANSON's »*Leo marinus*» and LINNÆUS' »*Phoca Leonina*» (»capite antice cristato»).

Concerning the size of these animals certainly exaggerated measurements have found their way into the literature.

VON DEN STEINEN (12) has recorded the length of an adult bull of Elephant-seal to about 5 m. and of a cow to about 3 m.

SÖRLING has recorded the following measurements of Elefant-seals in flesh, just killed:

	♂ ad. ⁹ / ₆ 05	♂ young ¹ / ₁ 05	♂ young ²⁵ / ₁₂ 04	♀ ad. ²⁶ / ₂ 05
Distance from snout to tip of tail	4,85 m.	1,67 m.	1,37 m.	2,75 m.
Distance from snout to end of hind-flippers	5,50 m.	2,00 m.	1,66 m.	3,10 m.
Distance from snout to anterior border of axilla	1,75 m.	0,56 m.	0,44 m.	0,62 m.
Interorbital breadth	25 cm.	9,3 cm.	8,2 cm.	11,4 cm.
Distance from snout to anterior corner of eye ¹	27 cm.	10 cm.	10,3 cm.	14 cm.
Distance from anterior corner of eye to ear-opening	17 cm.	8,5 cm.	8,3 cm.	11,3 cm.
Greatest breadth of snout	35 cm.	12 cm.	10,8 cm.	16 cm.
Distance from snout to corner of mouth	38 cm.	12,6 cm.	11,8 cm.	14,5 cm.
Distance from tip of lower jaw to corner of mouth	23 cm.	8 cm.	7,8 cm.	10,5 cm.
Breadth of head at kind margin of eyes	33,5 cm.	15 cm.	13,3 cm.	18 cm.
Breadth of head at ear-openings	60 cm.	21,5 cm.	18 cm.	24,3 cm.
Circumference of body just behind fore-flippers	4,15 m.	1,25 m.	1,13 m.	
Circumference at root of tail	1,10 m.	0,46 m.	0,40 m.	

This shews the striking difference in size between the sexes.

The colour of the quite young calfs was very dark almost black. In Nov.—Dec. the old bulls and cows, when dry, had an oily greenish grey colour, the young bulls were more greenish yellow. When the bulls returned in Febr. they were shedding the hairs and looked then dark rusty brown. After shedding the colour became first yellowish grey and then gradually passed into the oily greenish grey coat. The shape of the snout is the most characteristic of this animal. In young specimens it is so to say normal (Pl. III fig. 7) then it increases in size with age (Pl. IV fig. 17 & 15) and finally it becomes an inflatable proboscis which in rest is puckered up in three portions on the back of the snout but can be inflated as Pl. III fig. 6 shows or be allowed to hang loose and lax as in Pl. IV fig. 16. The temperature of the blood of an Elephant-seal SÖRLING measured to be + 35° C.

¹ Proboscis not dilated!

Concerning the biology of the Elephant-seals SÖRLING has made several interesting observations. In the middle of November (1904) when he arrived to South Georgia, the Elephant-seals were numerous on the shores. It was then the pairing season. The big old bulls lay high up among the tussock grass with their cows. They might lie there for weeks without going into the sea to procure food. The younger Elephant-seals were found nearer to the sea on the sandy beaches here and there (Pl. III fig. 8, 9 & 10). They lay always together in smaller or larger flocks. Once SÖRLING counted 28 in one flock. These younger animals went back and forth between land and water, often playing with each other in the water, splashing and diving and biting each other.

The old bulls appeared as a rule to be monogamous. Only once SÖRLING observed a bull with two cows and a similar observation captain LARSEN made once. The cow copulates with the bull while she has a new born sucking calf. The bulls are very jealous and ill-tempered if another bull should approach their cow. And in such cases often bloody fights ensue. The bulls go against each other, stretch up their necks, blow up their proboscis and open widely their big mouths. Finally they raise their body upright so that they rest on the belly and the pectoral fins are lifted from the ground and from such attitudes they throw themselves violently forward against the antagonist and try to fix their powerful canines in his head or neck. If they succeed in this, as they often do, pieces of skin and flesh are torn away and deep and ugly wounds are produced. While fighting this way they emit a peculiar sound which perhaps could be called a »bellowing or roaring by starts, intermittent like the neighing of an angry horse». They fight and roar till one of them feels defeated and crawls off. The victorious bull never pursues his rival but lies down to sleep again.

When a man approaches a pair, a bull and a cow, during this rutting season, the bull shows its jealousy in such a peculiar manner that it forces or entices the cow to an act of copulation before the eyes of the spectator. SÖRLING describes this thus: »The bull crawled up to the cow and lay one of his fore flipper over her. The cow then lifted up her hind-legs and the bull turned halfway over to the other side and emitted his male organ and then the copulation took place. The female shut her eyes and made some lateral movements in the horizontal plan. The male lay motionless (Pl. IV Fig. 12 & 13).

If a pair has selected a place they remain there till they are driven away by force.

As the pairing takes place soon after the birth of the young the development of the foetus must last about but not quite fully a year. The smallest young calf seen by SÖRLING measured about 1,25 m. and it was a suckling not many weeks old. This agrees with the opinion expressed by K. A. ANDERSSON (8) but differs from the same of VON DEN STEINEN (12) concerning the size of the young when just born. The former author found namely an uterine foetus already in May have a length of about $\frac{1}{2}$ m.

The bulls are very kind and tender-hearted towards the calfs and try to take

care of them. SÖRLING reports for instance, that, if a calf is driven into the water, the bull hastens as quick as possible to his aid, although he otherwise during this season does not want to go into the sea. He swims out to the young, swims before him, catches him over the neck (as a cat with her kittens) and tries in every possible way with mild force to get him ashore again and does not cease before he has succeeded in his endeavours and brought the young back to the mother again. The cow again is quite passive and does not seem to care anything about the whole proceeding.

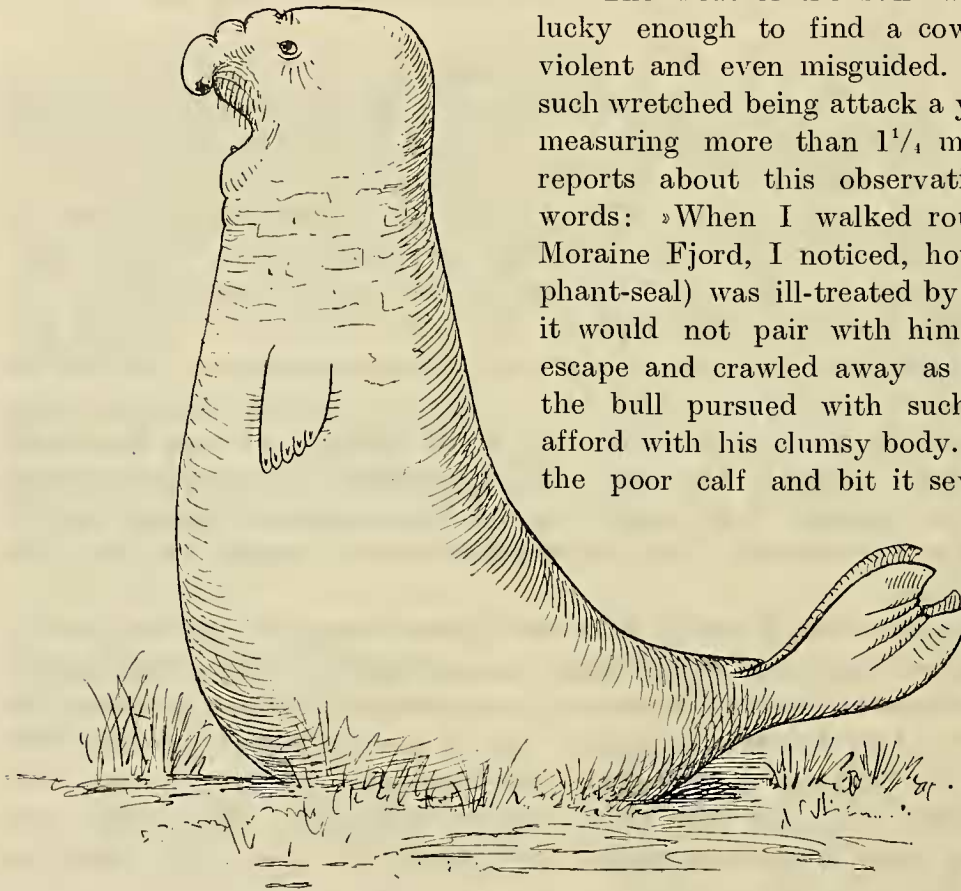


Fig. 1. Sketch of an irate Elephantseal.

The heat of the bulls which have not been lucky enough to find a cow is sometimes very violent and even misguided. SÖRLING saw once such wretched being attack a young animal hardly measuring more than $1\frac{1}{4}$ metre in length. He reports about this observation in the following words: »When I walked round one day at the Moraine Fjord, I noticed, how a small calf (Elephant-seal) was ill-treated by an old bull, because it would not pair with him. The calf tried to escape and crawled away as fast as possible, but the bull pursued with such speed as he could afford with his clumsy body. Finally he reached the poor calf and bit it several times with his big tusks. At the same time as he repeatedly bit the calf he emitted the male organ in its whole length.

When I thus perceived his nasty intention I came to rescue and teased the bull as much as I could.

I succeeded perfectly to draw the attention of the bull to me so he turned against me in hot rage and tried to bite me. Meanwhile the young calf escaped and disappeared.»

As a rule the Elephant-seals do not attack a man. They only blow up their nose and open their mouths widely and roar (Pl. III fig. 6) when disturbed. »They are too lazy to attack», SÖRLING thinks but he adds, »if an old bull is teased or worried he may, nevertheless, prove to be a dangerous foe if one stands in front of him and too near his head.» If roused to the highest pitch of rage he raises his body even higher than when fighting with another Elephant, in fact he stands almost

upright resting on the pelvic region, like the accompanying sketch, fig. 1 (made by SÖRLING) indicates. He is, however, so heavy and clumsy that he does not find time to strike before one has jumped to the side and the attack is always made straight forward. The only quick movement, he is able of, is to turn round. If, for instance, somebody steps on his hind flippers, he lifts them, and the anterior part of the body straight up in the air, often so high that the fore flippers do not reach the ground, and wheels round on the belly and then it does not last many seconds before he has turned round and faces the spot where he before rested his hind-limbs.»

SÖRLING observed only one somewhat more than middle-sized Elephant-seal that attacked without having been provoked in any way, but »that fellow went for me at once,» SÖRLING says, »as soon as he saw me, so that I had to go to the side for him every time I happened to meet him.» Other specimens even big bulls could be driven into the sea although unwillingly, but this one was too ferocious for that.

In the spring and till the end of Dec. the Elephant-seals »emit a peculiar sound similar to the barking of a dog or, sometimes a long-drawn howl; but it was only the young »Elephants» (Pl. III fig. 7) that contributed to the concert.» The old ones were silent except when fighting or offended in some way or the other.

When the Elephant-seals lie resting on the beach they have the habit of throwing sand on their backs with the fore-legs. SÖRLING is uncertain to what purpose this is done. »Perhaps it is only mischief,» he says, »perhaps it is to get dry more quickly, or it might also help as a relief against the itching feelings when the hair is shed but they do it also at other opportunities. As a protection against the sun it is hardly needed even warm days.» This throwing of the sand is done in such a way that the fore-flipper is pushed forward and gets a load of sand on its back and that is then thrown up on the body by a oblique movement backward upward. The same habit has also been noted by SCAMMON and others.

The Elephant-seals are mostly on the move during the night, then they are heard howling and so on. Towards the summer they became quieter and more silent with every night that went. The old Elephant-seals went into the sea towards the middle of Dec. so that about the 15—17th Dec. there was not a single old Elephant ashore in Cumberland Bay. The young ones remained on land but went back and forth from land to water. SÖRLING found a young one that appeared starved to death as it was very emaciated and nearly dead because the mother had left it too soon.

In the middle of February the *old* male Elephant-seals returned to Cumberland Bay. The female sex was also represented then but only by three specimens. They were then all of them shedding the hair and looked very ugly (Pl. III fig. 6), SÖRLING says.

When the Elephant-seals move on land from one place to the other they use only the fore-legs and supporting themselves on them they throw themselves forward with undulating movements of the body and meanwhile the hind-flippers are dragged behind quite slack as if lame. In fact, they never use the hindlegs when moving on land. In spite of this awkwardness the Elephant-seals crawl pretty far up on land.

SÖRLING saw to his great astonishment that they had chosen resting-places 5—600 metres from the shore and about 10 to 20 metres above the sea level.

When the old bulls had come ashore and crawled up from the beach SÖRLING saw them now and then raise the body so high that the fore flippers were lifted from the ground. They did that for the purpose of being able of looking round over the high tussock-grass. During this spying act they looked very comical. If satisfied with the lookout they lay down to rest a while and then crawled on again a distance equal, to their length of body or perhaps double that length, then they took a rest, and so on.

They lay partly single partly several together in groups. One such group consisted, for instance, of 6 very old males and one old female lying side by side. They

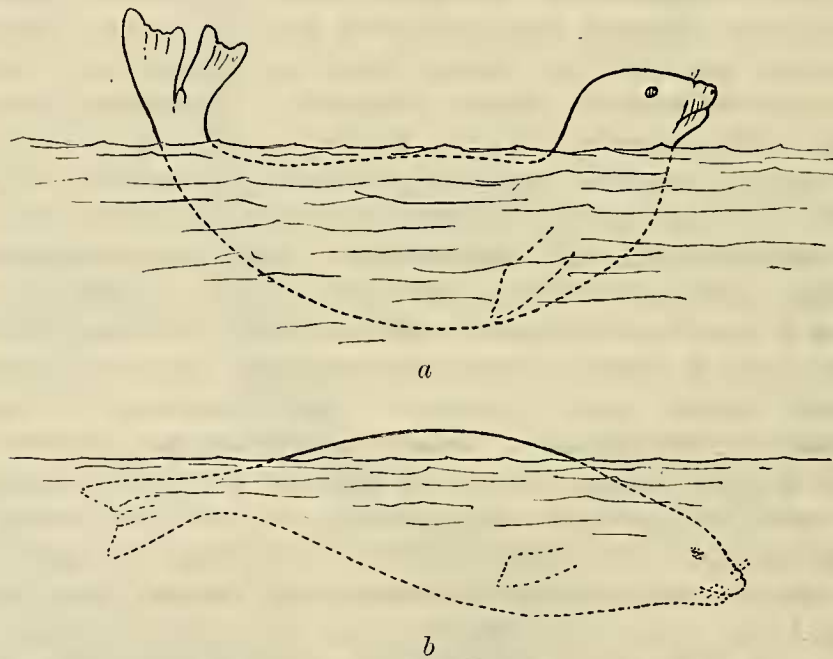


Fig. 2. *a*. An Elephant-seal basking at the surface; *b*. the same in the act of diving.

lie this way for several days, SÖRLING says, or even weeks without going into the water. »The place where they lie is moist and wet. Often big lairs or holes are formed where they lie. In these holes the water collects so that a large mudpuddle becomes the bed of the animal and a very stinking one it is. »I have seen Elephant-seals lie in such mud-holes, that were so deep», SÖRLING reports, »that only the snout and the eyes appeared above the surface.» The Elephant-seals love also to lie in the small fresh-water rivulets and small lakes.

When these animals lie at the surface of the water basking, they keep the head and the hind-flippers stretched up above the water in the air as the accompanying sketch indicates but the whole body is submerged. When they dive again the back is shown (conf sketch fig. 2).

The fore-flippers are very movable in almost every direction. When the Ele-

phant-seals lie on land they sometimes make with them very funny-looking movements as wiping the nose, scratching the head or back and so on. Similar observations have been made by different authors and VON DEN STEINEN (12) emphasizes the facetiousness of the movements and looks of the Elephant-seals.

SÖRLING could not find out wherein the food of these animals consisted. The stomachs of those he killed contained only sand, sometimes in considerable quantities, several litres. Remains of fish he did not observe at any time. It appears from this most probable to the present writer that the Elephant-seals feed on invertebrate animals which they collect at the bottom and then together with the food accidentally swallow the sand. Cephalopods are the chief food of their northern relative, *Cystophora*, and beaks of such have once been found in the stomach of an Elephant-seal by PÉRON, but no such were observed by SÖRLING.

The habits of the Elephant-seals of Kerguelen Island as described by the »Gazelle»-Expedition (15) are very different in many respects. It is said for instance that the fore-flippers are not used by the Elephant-seals, when crawling on land, but held pressed to the body, but the hind-flippers should be »etwas vorgezogen» and pressed towards the ground (»aufgestemmt»). Then the animal should support itself on these (»auf diese gestützt») and throw the body forward, again move the hind-flippers forward, put them to the ground and so on. If this statement should be correct and not based on erroneous observations it would be exceedingly peculiar if the behaviour of the Elephant-seals on Kerguelen Island should be so fundamentally different from that of its congeners on South Georgia.¹

The habits of propagation of the Elephant-seals of Kerguelen Island as told in the work mentioned (15) are said to be quoted from the narrative of a captain FULLER of a sealing schooner. This narrative appears also very mysterious and it seems probable that it has been based on observations on Sea-lions, Sea-bears or other eared seals rather than on Elephant-seals. It is namely said that an old bull, a »beach-master», shall collect a herd of females and youngs, up to 100, and watch these with great jealousy defending them against the intrusion of other bulls. The victorious bull is then said to satisfy a great number of females. Compared with the direct and repeatedly verified observations made on South Georgia (conf. VON DEN STEINEN (12)) this narrative certainly must be regarded as very doubtful.

HALL (l. c.) says that the Elephant-seals of Kerguelen Land did not agree with a plate of LESUEUR »in respect to the eyebrow bristles», and he adds »The »Elephants» here have no conspicuous eyebrow». On the quoted plate there is a row of bristles above the eyelid and such, although not so numerous as on the plate, were present in all South Georgia specimens, young and old, of both sexes.

An adult bull of the South Georgia »Elephants» may have a blubber-coat of

¹ HALL says about the Elephant-seals of Kerguelen Land — — »they are slow crawlers, using only two flippers, and the snake-like action of vertebræ and muscles» (»The Zoologist» 1900 p. 443), but which flippers he does not mention, although it might be assumed that he means the anterior.

a thickness from 15 to 20 cm. HALL found the blubber of the Kerguelen Land animals ranging from 2 to 6 inches (5 to 15 cm.) in depth.

*Ogmorhinus*¹ *leptonyx* (BLAINVILLE) 1820.

Syn.: *Phoca leptonyx* BLAINVILLE 1820.

Stenorhynchus leptonyx F. CUVIER 1826.

Ogmorhinus " PETERS 1875.

- +CO₂ ad. (skin etc.), Boiler Harbour, Cumberland Bay, the 14 of April 1905.
 ad. (skull), the same locality, the 21 of July 1905.
 ad. (skeleton), Cumberland Bay, the 20 of June 1905.
 ad. (skin etc.), Boiler Harbour, Cumberland Bay, the 15th of Aug. 1905.
 foetus, the same locality, the 24th of Aug. 1905.
 foetus, the same locality, the 10th of Sept. 1905.
 +CO₂ ad. (skeleton), the same locality, the 10th of Sept. 1905.

One of the type-specimens for this species is said to have come from South Georgia (conf. BARRETT-HAMILTON (6)).

The following measurements of just killed Leopard-seals were taken by SÖRLING.

	♂ ad. 14/4 05	♀ ad 15/8 05	♂ foetus 24/8 05
Distance from snout to tip of tail	2,85 m.	3,27 m.	1,13 m.
Distance from snout to hind-end of hind-flippers	3,20 m.	3,60 m.	1,29 m.
Distance from snout to anterior border of axilla	0,97 1/2 m.	1,8 m.	0,37 m.
Interorbital breadth	16,5 cm.	15 cm.	8,2 cm.
Distance from snout to anterior corner of eye	18,4 cm.	18 cm.	9,5 cm.
Distance from anterior corner of eye to ear-opening	9,6 cm.	13,5 cm.	4,3 cm.
Greatest breadth of snout	13 cm.	15 cm.	8,2 cm.
Distance from snout to corner of mouth	21,4 cm.	21,5 cm.	11,2 cm.
Distance from tip of lower jaw to corner of mouth	18,0 cm.	18,0 cm.	9,3 cm.
Breadth of head at hind margin of eyes	20,5 cm.	20,0 cm.	10,1 cm.
Breadth of head at earopenings	27,0 cm.	28,0 cm.	14,0 cm.
Circumference of body just behind fore-flippers	1,94 m.	2,30 m.	0,58 m.
Circumference at root of tail	0,65 m.	0,92 m.	0,28 m.

During the summer-months SÖRLING did not observe any Leopard-seals but in the beginning of April the first ones appeared and the last were seen in the beginning of October. About their habits SÖRLING has made several observations quoted in the following pages. If it is fine weather the Leopard-seals seldom go ashore, but are seen out in the fjords basking in the sun diving up and down with lazy movements. If a snow-storm is raging they lie on the shore, but in the evenings and early mornings they are always in the water feeding.

When there was plenty of small pieces of drifting ice in the bay the Leopard-seals liked to lie on such ice. They have on admirable faculty of jumping up on such ice and shoot up like on arrow out of the water and up on the ice even if it rises several feet above the surface, and when they have come up they crawl to the top of the ice. Sometimes if the pieces of ice are too high above the water, or if

¹ It is possible that tis name must give place to *Hydrurga* GÜSTL 1848, but the present author has not been able to procure GÜSTL's work.

the seals have too little speed they fall back again. They do not mind that, however, but repeat their attempts several times till they finally succeed.

SÖRLING once saw a Leopard-seal on top of a high piece of ice which suddenly lost the balance and turned round. The seal made involuntarily a long jump through the air and fell head foremost in the water but appeared to be completely unconcerned by the whole proceeding.

When the Leopard-seals haul up on shore they prefer sandy beaches and avoid — in opposition to what is the case with the Elephant-seals — the tussock-grass. Their long and comparatively slender body makes their movements even on terra firma much quicker and more graceful than those of the Elephant-seals. When on land the Leopard-seals never use their hindlegs, but with the fore-flippers they make »rowing» movements, especially if they work upwards a slope, sometimes, however, especially when going downwards, they keep the fore-flippers pressed to the body and immovable, while they throw themselves forward on the belly with undulations of the body.

The Leopard-seals are never seen in flocks on the shore like the Elephant-seals, but one is seen, here another there. Neither were specimens of these two kinds seen near each other. VON DEN STEINEN (12) saw once three Leopard-seals sleep near each other on the beach, but they were not in company and took no notice of each other. K. A. ANDERSSON (8) saw even as many as 10 on the same beach not far from each other, but this author, as well, denies that this seal is a sociable animal.

As a rule the Leopard-seals are not aggressive when on land. They only widely open their mouth without, however, emitting any sound but showing their formidable armature as if to try to scare off the intruder. But some are more ill-tempered and if they do not exactly attack, they at least defend themselves readily. The large and pregnant females are the most bad-humoured, and there is at least one example that such a one attacked when offended. SÖRLING tells about this as follows: »One day in the beginning of September, I walked along the beach to the »Leopard-point» and saw there a very large female Leopard-seal. She was between 13 and 14 feet long and the largest one I have ever seen. I stole up to her and tried to wake her by throwing some small stones at her. She woke and as soon as she perceived me she made straight for me, at once. I ran to the side and heard how her teeth clashed when she snapped at my legs. When I was some way from her she lay down again to sleep, but, as soon as I approached, the same manoeuvres were repeated. After a while she went, however, into the water.»

The usual proceeding when a Leopard-seal was disturbed was that he opened his mouth without any sound. If that did not scare off the intruder he wriggled off into the water, often emptying as well bladder as rectum on the way.

In the water the Leopard-seals are more aggressive. If a man is out in a row-boat the Leopard-seals are very apt to come and swim partly behind the stern, partly on the sides of the boat, often coming so close that it looks as if they wanted to get into the same. Dr. GUNNAR ANDERSSON was 1902 seriously pursued by a Leopard-seal when rowing in his canoe in Cumberland Bay. He landed as soon as

possible and the seal even went ashore near by. It might have been play, he said, but the case seemed so risky to him that he afterwards did not care to trust such a frail craft in company with Leopard-seals. SÖRLING says that he never saw any Leopard-seal attack the boat itself or try to ascend it, but one bit in his oar once. It happened thus in SÖRLING's own words: »One day I stood sculling a flatbottomed kind of a punt out on the bay. Suddenly a Leopard-seal came up and »blowed» quite close to the stern. I was rather used to such company so I did not care much, but soon he began to snap after the oar with which I sculled. I directed a blow at him each time he snapped after, or bit in the oar but he did not care at all. In such a way he pursued me all the way till I reached the shore when he turned back and swam out in the bay again.»

It might be as Dr. ANDERSSON suggests that these manoeuvres, at least partly, indicate playfulness. but considering the powerful dentition of these seals and the repeatedly stated fact that they not only feed on fish but also catch penguins and other seabirds it appears safest not to allow too great liberties with such formidable play-mates.

The food of the Leopard-seal consists in fishes and penguins, and other birds. Captain LARSEN says, that even the latter are, at least in some instances, swallowed in one bit. K. A. ANDERSSON (8) observed once how such a seal had caught a *Pygoscelis adeliae*. Like a cat it played with its prey, let it go and caught it again, but finally it tore the penguin to pieces shaking it above the surface of the water and swallowed one piece after the other. VON DEN STEINEN (12) found once 2 diving Petrels (*Pelecanoides*) in the stomach of a Leopard-seal.¹

The female Leopard-seals are according to SÖRLING's observations considerably larger than the males. As a rule these seals do not exceed a maximum-length of 3,60 m. according to the same authority. »12 feet» has also been recorded by others. VON DEN STEINEN (12) gives the measurements of three males to resp. 2,15, 2,54 and 3,0 m., and of a pregnant female to 2,97 m. The average length he regards to be about 2,5 m. and the largest he measured »parallel dem Körper mit dem Alpstock 3,70 Meter.» Smaller specimens than 2 m. were not seen by the German Expedition 1882.

The habits of propagation of the Leopard-seal are not yet fully known. The Swedish Expedition 1902 (8) killed several pregnant females of Leopard-seal which in the month of May contained each a foetus of a length of 44—48 cm. BORCHGREVINCH narrates (vide (6) p. 73) that he killed in September in Robertson Bay, South Victoria land, a pregnant seal of this kind which had a foetus so large and full-grown that it could be kept alive »on condensed milk»(!).

SÖRLING says that he never found any newborn youngs of Leopard-seal on South Georgia. But he killed several pregnant females which contained so large foetuses that it seemed only to be a question of a day or two when they should have been born. He also cut out foetuses which were very lively and lived for a

¹ Captain LARSEN had carried some geese with him to South Georgia. One day the gander had a strongly bleeding wound in the wing. A Leopard-seal was suspected to have done this and it is not improbable the more so as the geese from that day avoided the water most carefully.

day afterwards, but not having any suitable food for them he could not raise them. From the snout to the tip of the tail one of these foetuses measured 1,13 m. It was cut out of the mother-seal the 24th of Aug. 1905. Others at that time were of similar size. The 15th of Aug. a foetus was taken which measured 95 cm.¹

A foetus cut out by SÖRLING the 20th of July measured about 80 cm. The ratio of growth of the foetus from May (44 to 48 cm.) to July (80 cm.) and to August (95—113 cm.) is thus known. Probably the young are born the last days of August or in the first half of September, but where has not yet been stated and likewise it is unknown when and where the pairing takes place.

Leptonychotes weddellii (LESSON) 1826.

syn.: *Otaria weddellii* LESSON 1826.
Stenorhynchus » LESSON 1827.
Leptonyx » GRAY 1837.
Leptonychotes » GILL 1880.

♂ juv. (skin etc.) Boiler Harbour, Cumberland Bay, the 10th of April 1905, »Iris brown».
 ♂ juv. (skull) Moraine Fjord, Cumberland Bay, the 1t of Sept. 1905.
 ♀ juv. (skull) Cumberland Bay, the 24th of Sept. 1905.

Weddell's seal does not appear to be a regular inhabitant of the seas round South Georgia. The German Expedition 1882—83 did not observe it there, nor did the Swedish Expedition 1902.

SÖRLING observed, however, specimens of this kind several times in the winter, so that it seems probable that single individuals during the winter, more or less frequently, stray so far north as to South Georgia. It may even be more common there than it appears to be, because it does not stay so long time at the same place as the other species of seals do, nor does it go so far up on land when ascending the beach as the others do. »I never saw any Weddell seal higher up on the beach», SÖRLING says, »than at most two meters from the water line, and I sometimes observed it lying at the waters edge so that the hind flippers lay in the water or at least in the spray from the waves. When one approaches this seal it does not open the mouth nor howl, but only tries to escape into the water as quickly as possible. It appears to be very shy and nervous when one comes near to it.» These SÖRLING's observations must, however, be seen in the light of the fact that at least the greater part of the animals seen by him were young and all of them single.

The first specimen was seen in the Moraine Fjord, Cumberland Bay the 2d of April 1905. It lay close to the water and went into the sea before it could be killed.

The second was the young male recorded above as killed the 10th of April 1905.

¹ The mother seal of this measured 3,27 m. in length.

The third was shot in the Moraine Fjord by some of the crew of the whaling steamer the 16th of April 1905. The skin was presented to the Zool. Museum of Kristiania. It was a young female.

The fourth was a young male shot by SÖRLING in the beginning of August. It lay on the beach at the »Leopard-point» in Boiler Harbour. The multitude of drifting ice did not permit SÖRLING to bring it to the factory the same day and the following day it had been carried off by the ice.

The fifth was found by the crew of the steamer »Rolf» in the Moraine Fjord the 1st of Sept. It was a young female.

The sixth, also a young female, was killed by the crew of a Chilenian sealing vessel in Cumberland Bay.

The same crew had some time before, in the beginning of Sept., in Possession Bay killed another specimen of Weddell's seal the skin of which SÖRLING saw. There were thus in all with certainty observed 7 specimens on South Georgia during the winter 1905.

The following measurements of a just killed Weddells seal were taken by SÖRLING:

	♂ juv. 10/1 04.
Distance from snout to tip of tail	2,00 m.
Distance from snout to hind end of hind-flippers	2,25 m.
Distance from snout to anterior border of axilla	0,57 m.
Interorbital breadth	9,1 cm.
Distance from snout to anterior corner of eye	9,3 cm.
Distance from anterior corner of eye to ear-opening	7,6 cm.
Greatest breadth of snout	10,1 cm.
Distance from snout to corner of month	11,5 cm.
Distance from tip of lower jaw to corner of mouth	8,8 cm.
Breadth of head at hind-margin of eyes	13,3 cm.
Breadth of head at ear-openings	18,3 cm.
Circumference of body just behind fore-flippers	1,38 m.
Circumference at root of tail	0,55 m.

Weddell's seal seems to feed exclusively on fish. The norwegian sailors therefore called it »Fiskesæl», that is »Fish-seal».

Lobodon carcinophagus (JAQU. & PUCHER.) 1842—53.

syn: *Phoca carcinophaga* JAQU. & PUCHER. 1842—53.

Lobodon carcinophaga GRAY 1844.

Stenorhynchus serridens OWEN 1843.

Stenorhynchus carcinophagus FLOWER & GARSON 1884.

In April SÖRLING saw a single specimen of seal which was uniformly »light greyish, sandy brown without any spots». It had hauled up on the sandy beach of the »Leopard-point». When SÖRLING approached, it hurried into the water without opening its mouth or behaving as the Leopard-seals usually do. It might therefore be possible that this was a »Crab-eater», but, if such was the case, it was the only

one of its kind seen in Cumberland Bay that year. It does not really belong to the fauna of South Georgia but is at home in higher southern latitudes among the ice.

The rat of South Georgia.

Mus norvegicus Erxleben 1777.

var. *Georgiæ*?

syn. *Mus decumanus* PALLAS 1778.

3 specimens in alcohol from the tussock grass at Cumberland Bay, winter 1905.

It has for a long time been suspected that there should exist a terrestrial mammal on South Georgia. KLUTSCHAK¹ called a place east of Bay of Isles »Rattenhafen» in consequence of the rats supposed to live there. VON DEN STEINEN (12) entertained for some time, he says, the hope that he should find an endemic Rodent or something like that, but soon every chance of such a discovery appeared futile.

The Swedish Expedition 1902 had, however, more luck so far as tracks of a small mammal were found. The Zoologist of the Expedition, K. A. ANDERSSON (8) writes about this as follows: »Als wir am 8 Mai die Inselbai an der Nordküste von Südgeorgien besuchten, nahmen wir am Strande deutliche Spuren von einem Land-säugetier wahr. Ungeachtet unserer Versuche konnten wir an jenem Tage kein Tier finden, und während unseres folgenden Aufenthalts dort waren wir durch schlechtes Wetter am Landen Verhindert. Die Spuren waren nämlich zugeschnitten, sodass es schwer war sie überall hin zu verfolgen, an mehreren Stellen waren sie aber doch so deutlich, dass ihre Anordnung leicht wahrgenommen werden konnte. Sie waren in Gruppen von je 4 Fussspuren geordnet: 2 neben einander und dicht dahinter 2 etwas schräg gestellte und etwas kleineren als die vorderen. Diese letztgenannten waren offenbar Spuren von Hinter- und die kleinere solche von Vorderfüssen. Spuren von denselben Füssen lagen in einem Abstand von 28 cm. hinter einander. Unter einer Felsplatte, wo die Spuren nicht überschneit waren, konnte ich an einer Stelle die Abdrücke von 4 Zehen und den undeutlichen einer fünften sehen. Es ist wohl nicht wahrscheinlich, dass das betreffende Tier hier endemisch sein könnte. Am wahrscheinlichsten ist es wohl ein durch Robbenfänger eingeführtes Tier von der Gattung *Mus*, das dann verwildert, worauf auch das Aussehen der Spuren bestimmt hinweist.» — — —

Another member of the Expedition Dr. J. GUNNAR ANDERSSON was more disposed to believe in the existence of an endemic mammal.

It was in either case of great interest to get the question solved, and therefore when SÖRLING went off to South Georgia the present writer strongly implanted in his mind to look for the mysterious mammal. He did so and finally succeeded in

¹ Ein Besuch auf Süd-Georgien. Deutsch, Rundschau f. Geogr. u. Stat. Jahrg. III Hft 11. München 1881.

catching some specimens which were preserved in alcohol and carried home, and then the correctness of K. A. ANDERSSON'S views was confirmed.

SÖRLING reports on his endeavours in finding the rat as follows. »Not before the winter had arrived could I possibly have any hope of success in trapping the mysterious rat. The first snow fell in the middle of April. I then found the first foot-prints of rats on the southern side of the Moraine Fjord, about three kilometres from the factory. These tracks looked as the accompanying sketch shews and appeared



Fig. 3.
Tracks of the South Georgia rat.

red to belong to four different specimens. I then put out steel-traps and other traps at different places where the rats had passed. For bait I used raw fish, potatoes, fried pork, carrots, pieces of apples etc. The following morning I went to search the traps, but without result. And so it went on, to my great disgust, for some weeks, although, as I found from new

footprints in the snow, the rats had passed within a metre from some traps without visiting them. Continuous snow-storms for a couple of weeks then hindered any trapping.

During moonlight nights I watched and tried to get an opportunity to shoot a rat but I was not lucky enough even to see any. It is certain, however, that they are on the move during the nights or early mornings and they stroll about round the tussock-hills but all tracks I followed ended among the stone-heaps on the sides of the rocky hills or at the foot of the mountains. The tracks often lead down to the shore where the rats appeared to seek food.»

Finally SÖRLING succeeded in catching two rats among the tussock-grass and a third was caught by a dog rather far from the factory.

The tracks of rats first found could not have been made by animals introduced by the vessels used by the whaling-expedition itself for several reasons. Firstly the tracks that were first observed were found very far from the station as at the Moraine Fjord, below Mount Duse on the Leopard-point etc. Secondly the ships were, to begin with, anchored at a great distance from land, and not before the middle of May a vessel coming from Buenos Aires with coal, provisions and empty barrels was hauled up to a kind of wharf at the shore. This vessel was also the first on which rats had been observed. From this time, however, the tracks of rats around the station greatly increased so that it became rather uncertain if a track was made by a native or introduced rat. SÖRLING believes, however, that the native rat as a rule did not leave any track of its tail as the recently introduced rats did. He had namely followed tracks in the snow in places very far from the station for several kilometres and found the tracks to be similar all the way, except when the tracks went up a steep hill, for then there were tracks left of the tail. The snow was then so deep that there were impressions made by the body for every jump.

Whether this difference of the tracks holds good, or not, it is quite certain that South Georgia was inhabited by a rat before any had been introduced by Captain LARSEN'S ships. It is, however, more difficult to decide, with full certainty, if the

rats caught belonged to the native rats or the ones latest introduced, because at the time when the rats actually were caught among the tussock, an invasion of rats from the ship had taken place and it is uncertain how far they could have spread themselves although it is most probable that they kept themselves round the factory where food was to be gotten in abundance.

One of the three rats caught among the tussock, viz. the one killed by the dog differs considerably from the common *Mus norvegicus* with regard to the colour of the fur. It is decidedly more reddish or rusty brown in the general colour than the common rat. The longest hairs, which dominate on the back, are tipped with blackish brown. The other hairs are rusty red or rusty yellow. These glisten through the blackish hairs on the back and dominate on the neck and crown. The nose and the sides of the head are covered by brown and buffish hairs mixed, the former dominating. The chin and the throat are white, the lower side of the neck whitish with a stitch in yellow, the breast and the belly pale sulphur yellow. On the sides of the body the colours of the back dominate but hairs coloured as those of the belly are mixed in and produce a brindled appearance. The feet are whitish grey and the tail is greyish brown. The lower and longer whiskers are white the upper and smaller blackish.

The other two specimens are similar to this one but the yellow shade of the belly is less pronounced. These two specimens are not quite fullgrown, which may explain the difference.

The skull is similar to that of the typical *Mus norvegicus* but in one of the specimens the interparietal is circumscribed in front and behind by equally curved lines and ends laterally in sharp points, in another it is rhomboidic in shape and blunt at the lateral ends. The series of cheek-teeth is shorter than the length of foramina incisiva.

For comparison SÖRLING caught some rats on board the ship and they looked like common rats. When skinning the different specimens it was found that the rats caught in the tussock have a much thicker skin than those caught on board the ship. The former have also a denser and longer fur which of course is an adaptation to the climate. It thus appears as if the South Georgia rat had undergone some change since its introduction, even if it is not very great. Its maximum age on the island cannot be more than about 100 years and it is probably less.

Whales.

Toothed Whales.

Orca sp.

Killer whales were frequently seen by the captain and crew of the whaling steamer. Captain LARSEN even shot at one once but missed him. One day it was told that a Blue whale had been attacked by Killer whales and that pieces of blubber had been found-floating on the surface of the sea, but no details are known so that the story is quoted with all reserve.

Delphinus sp.

Two or three times dolphins were seen from the whaling steamer, always in bad weather. SÖRLING heard the sailors say that these dolphins had rather high dorsal fins, but that was all he learned about them, and he never saw any himself.

Whalebone Whales.

Balenoptera intermedia (BURMEISTER 1866).

Syn: *Sibbaldius antarcticus* BURMEISTER 1865.

Balenoptera intermedia BURMEISTER 1866.

Some pieces of baleen of specimens killed off Cumberland Bay.

The name *Sibbaldius antarcticus* was established by BURMEISTER on the »6 feet broad and 3 feet high» bladebone of a whale which had been found near Buenos Aires. Later on the same author had the opportunity of studying two stranded specimens which, when the skeletons had been examined, proved to be younger individuals of the same kind. He then gave, however, a new name, *intermedia*, when he could fully describe (17) the animal and found that it in some points e. g. stature, was intermediate between the northern Blue Whale (*B. musculus* (Lin.), *B. sib-*

baldii auct.) and the southern Rorqual or Finback called by BURMEISTER *B. patachonica*. The specific name *antarctica* should have had priority before *intermedia* if GRAY had not used this name previously in the »Zoology of the Voyage of H. M. S. Erebus and Terror». Vol. I p. 51 (said to have been printed 1846). In this work the name *Balænoptera antarctica* is proposed for a whale from New Zealand the baleen of which was »all yellowish white», thus certainly not a Blue whale.

The first stranded specimen of *Balænoptera intermedia* which BURMEISTER examined 1866 in Buenos Aires, where it had been brought, measured 58 feet in length. It was a young female and its colour was described as being »dark slate grey, on the back almost shading into black». From the nape to the dorsal fin irregular paler spots of the same colour as the under parts were seen. Only the inner surface of the pectoral fin and its outer margin were white, although the same colour shaded over the axilla to some extent. The baleen was black.

The second specimen of which BURMEISTER also obtained the skeleton was a somewhat larger male measuring 60 feet (18,30 m.) in length. The colour of this specimen was »dark slate grey» all over and also somewhat spotted on the back.¹ Below the tail region it was somewhat paler, and especially the lower surface of the flukes were paler than the colour above. The throat-region again was darker. The colour of the pectoral fins was such as in the first mentioned specimen. BURMEISTER (17) gives also a detailed description of the skeleton of *B. intermedia* and compares it with the osseous system of other species.

If only exterior characteristics are taken into consideration, *Balænoptera intermedia* BURMEISTER may be diagnosed as a Rorqual (*Balænoptera*) of the southern seas, rather similar to the northern Blue whale (*B. musculus* LIN.), entirely slate coloured, somewhat paler or darker in some parts, but only white on the inner surface and outer margin of the pectoral fin, this colour, however, more or less shading over into the axilla; baleen black and bristles black.

The whale described by HECTOR (19) under the name *Physalus australis* cannot be regarded, as has been done by TROUËSSART², as identical with BURMEISTER's *B. antarctica* resp. *intermedia* when the latter is diagnosed as above from BURMEISTER's own descriptions. The baleen of HECTOR's *Physalus australis* is namely said to have been »light slate grey with vertical bands of black, some blades nearly white, yellowish white», and its bristles white. Such a baleen is characteristic of Rorquals of the group to which *Balænoptera physalus* (LIN.) (*musculus* auct.) and *B. patachonica* BURMEISTER belong. Another whale, however, also stranded at New Zealand, belongs evidently to the Blue whale group. Its baleen is described by HUTTON³ as being black, and the length of the animal shall have been 109 feet. This measurement, even if it might be exaggerated, certainly indicates a *Balænoptera* of this group.

¹ It may be suggested that these spots are not quite primary but results of the wearing of the skin of the dead whale against the bottom and shore before it was described.

² Cat. Mam. T. II p. 1080 Berlin 1898—99.

³ In the same volume as HECTOR's *Physalus australis* (19).

Another name »*Balænoptera Brasiliensis*» connected with a whale with black baleen is more doubtful. It was established by GRAY for »specimens of what is called in trade Bahia Finner» and only on the black baleen. When nothing else is known about the animal itself it may be suggested that the »Bahia Finner» in reality was a *Megaptera* because it was at home in such a warm climate.

The descriptions in the literature which may with some certainty be referred to the southern Blue whales appear thus to be restricted to BURMEISTER's *Sibbaldius antarcticus* resp. *Balænoptera intermedia* and HUTTON's great whale with black baleen from New Zealand. Whether these two are identical or not is not proved. But in addition to these descriptions there is a number of observations made by different expeditions in the antarctic seas. These have been extensively quoted and discussed by RACOWITZA (18) in the valuable work in which he has described his own observations on whales, during the expedition with »Belgica». Quite recently E. WILSON (14) has shortly reported on the experience of the »Discovery» Expedition concerning Rorquals in Ross' Sea. Concerning such observations may thus especially be referred to the work (18) of RACOWITZA in which he gives a very interesting account of his experience about the size, movements, respiration etc., of the southern Blue whale. The author mentioned calculates the length of this whale to 20--25 m.; the colour of its back is »slate grey, very dark and with bluish shades, uniform without spots.»

As no whale was caught by the »Belgica» Expedition RACOWITZA must confine himself to observations of the living animals in the sea.

During SÖRLING's stay at the whaling station in Cumberland Bay, South Georgia, about a dozen Blue whales were caught and brought to the factory. The head and anterior end of one of these is seen in fig. 19 (Pl. V).

The largest of these specimens brought ashore in Cumberland Bay was 82 feet, the average size 70--75 feet.

The colour of all the specimens landed at this whaling factory is described by SÖRLING as being bluish slate grey all over, with a somewhat darker shade towards the back. Only the inner side of the pectoral fin was milky white unspotted.

Also the lower side of the tail flukes were whitish. The furrows of the throat are not lighter than the surroundings.

SÖRLING describes a characteristic of the skin of the Blue whale in the following way: »There are numerous quite shallow pits with irregularly radiating, fine white lines (not thicker than a stroke with a lead-pencil). Each pit is about 2--2½ cm. in diameter and the depth is quite trifling. These pits are found on the sides between dorsal and ventral surfaces. They are very numerous and situated at a distance from each other about equal to the diameter of a pit. The greatest number is met with on the flanks between the pectoral fin and anus. From that area they decrease in number in every direction.»

The baleen of the southern Blue whale is completely black. But on the dry blades there are innumerable tiny grey pits perhaps produced by some parasitic organism (Pl. VIII fig. 36). The bristles are coarse blackish brown or black. They

are rather long and measure from 20 to 40 cm. (8—16 in.), or more on a large blade. The largest blade carried home by SÖRLING has a length along the outer margin of about 85 cm. without bristles but with the parts in the gum included. On the inner side a piece is broken off, how much is difficult to say, but probably not very much. The present basal breadth is about 48 cm.

When BURMEISTER (17) records for one of his types for *Balænoptera intermedia* a length of the baleen of 60 cm. and a basal breadth of 24 cm. these proportions appear to be very different from those stated above for the Blue whale of South Georgia. As BURMEISTER (17) says that he received the complete series of baleen from both sides of the mouth »unversehrt«, it can hardly be supposed that he has measured broken blades. The narrowness (when compared with its length) of the baleen of the type may, however, stand in connection with the youth of the specimen. It cannot possibly be assumed that there is a race of Blue whale at the coast of Argentine and another at South Georgia.

The length of the blades from South Georgia is approximately the same as that recorded by TRUE (20) for the baleen of the northern Blue whale.

The northern and southern Blue whales are certainly, at least very closely related. To decide whether they ought to be regarded as different species or not is for the present impossible until sufficient material, especially osteological, has been collected. With regard to the exterior I think, I remember that Captain LARSEN has told me that the southern Blue whale was according to his observations more slender than its northern relative.¹ In the former the white spots, which are scattered over the under surface of the latter and especially on the posterior ends of the abdominal ridges, appear to be entirely lacking. At least, SÖRLING did not observe any such in the specimens examined by him.

Although no good distinguishing characteristics between the two races are fully known as yet, it is wiser to use BURMEISTER's name for the southern Blue whale, so that confusion may be avoided. It has already been mentioned that only a dozen Blue whales were shot by Captain LARSEN's whalers and tugged to the factory. Many more could have been killed, but as long as the whaling steamers had any opportunity of catching Right whales or Humpbacks they did not care to trouble themselves with shooting Blue whales. The latter are namely very much leaner, and, having less blubber,² they sink when killed. To secure such a whale when killed an iron chain is lashed round its tail, and then, through a hole made with a lance, air is pressed into its abdominal cavity by means of an air-pump and an iron tube. A wooden plug is then put into the hole and the whale is thus kept floating and tugged to the factory. But the Blue whale is at the same time much more difficult to kill than the almost tame Humpbacks, which yield comparatively much

¹ A similar opinion is expressed by BURMEISTER (17) when he says, as quoted above, that his *B. intermedia* »hält in ihrer Statur die Mitte« between the northern Blue whale and »*B. patagonica*« which latter is a slender *B. physalus* type.

² In spite of its size a southern Blue whale did not yield more than 45—55 barrels of oil. Old empty kerosene barrels were used for the transport of the oil, and when the word barrels is used below such are meant.

more oil. The carcass of a Blue Whale is also very heavy to manage when the weather is bad. This difference has afforded some protection to the Blue whales as yet.

The southern Blue whale inhabits the seas round South Georgia the whole year and does not seem to migrate. The area where it generally is found is a couple of english miles from the shore, nearer to the shore than where the Humpback schools go. The Blue whales appear usually in small companies of 2—3 together. It is less lively than the Finback and somewhat easier to catch. SÖRLING observed Blue whales not only at South Georgia but the whole way up to Buenos Aires when he returned in Oct. 1905. Even when he had left Buenos Aires for Europe he saw a Blue whale accompanying the steamer a whole day off Rio Grande do Sul. SÖRLING observes that the steamer was painted grey and rather similar to a Blue whale in colour only somewhat lighter, and this may have been an attraction.

The »blow» or spout of the Blue whale is not so high as that of the Finback, SÖRLING says, and more »broom-shaped». WILSON (14) estimates the height of the spout to 12—15 feet. SÖRLING says, that it is difficult to decide how high the jet of vapour really is, but assumes that it must be considerable as the spouts of the Blue whale could be seen at so far a distance that it appeared to be at the horizon.

When the Blue whale sounds it stays below the surface more than a quarter of an hour according to RACOWITZA's (18) opinion but he is not quite sure about the correctness of his observation. According to SÖRLING it remains below from 10—15 to 30 minutes.

It does not show the caudal fin when it sounds, an observation in which RACOWITZA and SÖRLING agree.

Its food consists of »kril», that is Euphausiids.

Balenoptera quoyii (FISCHER) 1830.

Syn: *Balæna Quoyii* FISCHER 1830.

?*Balænoptera australis* auct.

Balænoptera patachonica BURMEISTER 1865.

Physalus australis HECTOR 1875.

Balænoptera musculus? PARKER 1884.

A skeleton of a male specimen shot outside Royal Bay, South Georgia the 2d of Jan. 1905.
Several pieces of baleen of the same.

There prevails a great confusion concerning the names of the southern Finback. FISCHER's description is rather insufficient, but the recorded length of the whale and what he says about its dorsal fin etc. agrees better with a Finback than with a Blue whale and when the habitat of the animal is said to be in the seas round the Falklands it does not seem too risky to accept FISCHER's name for the southern Finback of the Atlantic hemisphere. If this again is identical with the Finback of New Zealand, or not, is, of course, not yet proved, but as it seems probable the

two last names have been added, to the synonymic list, as they certainly have been used for whales belonging to the group of *Balænoptera physalus* (LIN.) (or *musculus* auct.).

The name *Balænoptera australis* has no doubt partly been used for the species in question, but for others as well. An example of the latter proceeding is, when, according to GRAY's quotation in »Cat. of Seals and Whales in the Brit. Mus.»,¹ a »Fin-backed Whale» from Kerguelen Land »about 30 feet long» and with the dorsal fin »arched backwards, nearly over the pectoral», is called with this name. It seems rather more probable that this whale is identical with either of the two small (20—30 feet) Finbacked whales which were observed by the »Discovery» Expedition according to E. WILSON (14), or perhaps with *Balænoptera bonaerensis* BURMEISTER.

When BURMEISTER sent to GRAY his first report² about the whale which he proposed to call *Balænoptera patachonica*, he described the skull and some parts of the skeleton, but the specimen had come ashore so much earlier as some thirty years previously and all skeletal parts were not preserved. It is therefore probable that the plates of »entirely black» baleen which BURMEISTER attributed to this species did not belong to it, and he seems rather uncertain about this himself. He says that the museum of Buenos Aires possessed »two kinds» of black baleen viz. »one 5½ feet and the other 1 foot 8 inches in length.» And he proceeds: »This last only may be from the *Balænoptera*; the other perhaps from a *Balæna*» — — — Thus it is not proved at all that even the short, black baleen had belonged to the type of *Balænoptera patachonica*. In a later account, however, (17) BURMEISTER describes the baleen of *B. patachonica* as party-coloured viz. »dark blackish grey and yellowish white», thus being of the Finback-type so to say.

The exterior of the animal was unknown to BURMEISTER as he did not see the carcass before blubber and meat was already removed.

The whale described by HECTOR from New Zealand, as alluded to above, was »much decomposed» when found. The author quoted describes it, however, as »slender in proportion to height». The »low recurved and pointed fin on the back» was situated »just over the vent». The baleen was »black on outside edge, shading to pure white inside the mouth». The total length was 70 feet.

With these short notes it appears as if the knowledge about the exterior of the southern Finback was practically exhausted.

In his interesting work on the observations on Cetacea during the 'Belgica' Expedition RACOVITZA (18) does not refer any of the observations to a Finback of the *Balænoptera physalus*-type. He speaks, however, a good deal about a »*Balænoptera* cf. *Borealis* LESSON» the dimensions of which he estimates to about 12—15 m. This size is too small to be the Finback meant to be described below and certain observations concerning the habits of RACOVITZA's whale differ as well, from the reports SÖRLING has delivered about his experience concerning the great Finback of the South Georgia seas. I dare not therefore regard these whales as identical.

¹ London 1866.

² Printed in Proc. Zool. Soc. London 1865.

But the whales which the experienced whaler Captain A. LARSEN saw during his cruise with »Jason» 1893 and termed »Finnwal» were no doubt of the *B. phycalus* (LIN.) type.

While SÖRLING staid at the whaling station about a dozen or a few more Finbacks were killed and brought to the factory. The reason why the number was not greater lies therein that the hunt of this species is even more difficult and less profitable than that of the Blue whale, not to talk about the Humpback and Right whales, the whalers favourites.

The average length of these Finbacks was about 60 feet. They were shiny black above and white below (Pl. V fig. 18, 21 & 22). The tip of the pectoral fin was greyish white, otherwise the outside of the flipper was black and the inside white. The skin in the furrows is pink or light red. The flukes are also white on the under side (Pl. V fig. 23).

SÖRLING did not observe any such »pleuronectism» as makes itself known in the northern Finback, that is, that the light colour extends higher up on one side than on the other. All the photos show the left side of the whale and there, at least, the black colour extends to the mandible (comp. Pl. V fig. 18 & 22).

The colour of the baleen is very irregular. Sometimes all the blades are party-coloured, striped with slaty blackish and slaty bluish grey and yellowish white. Sometimes some of the anterior small blades are uniformly yellowish white either on one (just as well left as right) or on both sides of the upper jaw. Sometimes the posterior small blades, as well, are entirely yellowish white, either on one (just as leave left as right) or on both sides of the mouth. The only constancy is that the large blades in the middle of the series always are striped blackish, slaty bluish grey and yellowish white. The colours are in the latter case usually distributed in such a way that the lateral margin of the blades always is darkest, almost black over a more or less broad area, then follow in an inward direction with regard to their width irregular stripes of lighter and darker colour (Pl. VIII fig. 37). The light colour is usually represented by a light slaty bluish grey, sometimes in the medium sized and small blades also by yellowish white. The bristles are at the lateral margin of the large blades, and corresponding to the black stripes there, almost black, or dark brown; in an inward direction the colour fades and the bristles become paler, from light brown to dirty white. As a rule, the bristles at the end of a light streak are conspicuously paler than those corresponding to a dark streak, but the limits between the colours of the matted bristles are not so sharp as those on the blade itself. On the smaller blades the bristles are paler and may be light brown or brownish white even at the exterior margin which corresponds to a slaty black streak. On the interior portion of such smaller blades the bristles are often uniformly whitish in spite of the slaty streaks of the blade itself.

The bristles are much coarser on the large blades than on the small, and on the former those of the exterior portion are very much thicker and coarser than the interior ones of the same blade. In the specimen particularly described here, SÖRLING counted about 432 blades of baleen on either side of the upper jaw.

The foremost blades of baleen, situated at the tip of the jaw, were 12 cm. long. The blades then increased in size in a backward direction till they reached a length of 60 cm. counted from the surface of the gum to the tip without the bristles. This greatest length was attained at a distance from the tip of the jaw of 2 m.—2,20 m. From this place the blades again decreased gradually in size in a backward direction so that the hind-most only attained a length of 3—4 cm. above the gum.

The blades stick into the gum to a considerable depth, so that the largest pieces of this same whale, which have been preserved and brought home by SÖRLING, measured when cleaned and in a dry state about 75 cm. in length along the outer margin without bristles.

This length is fully as great as the greatest recorded by TRUE (20) for northern Finbacks in the table of measurements compiled by this author. The southern Finback has thus at least as large baleen as the northern race. The basal width of the largest blades SÖRLING has brought along is about 30—35 cm. but the innermost portion is broken off so that they may have been somewhat still broader, although probably not much.

BURMEISTER (17) has recorded the dimensions of the largest blades of baleen of his specimen of »*Balænoptera patachonica*» which had a length of about 50 feet to be 60 cm. in length and 15 cm. in breadth. This relation between length and breadth appears to be very strange and probably the great narrowness must be attributed to mutilation on the inner side, but it might also be caused by the youth and small size of the whale itself. It must, however, be born in mind, although it cannot be fully explained now, that BURMEISTER has recorded for both Finback and Blue whale comparatively much narrower baleen than those actually taken from specimens of the corresponding species at South Georgia, and in both cases BURMEISTER's specimens were smaller than the latter.

The southern Finback has, unlike the northern race neither hairs at the lower nor at the upper jaw, according to SÖRLING's observations.

The backward extension of the furrows of the throat and breast may be seen on Pl. V fig. 21 where the longest are seen to end on the sides of the navel. On a male specimen of Finback shot outside Royal Bay, South Georgia the 2d of Jan. 1905, the skeleton of which was preserved, SÖRLING took the following measurements.

From tip of snout to hind margin of caudal fin (in a straight line)	19 m. 60 cm.
From tip of snout to beginning of dorsal fin	14 m.
From tip of snout to posterior margin of dorsal fin	16 m. 30 cm.
From anterior margin of dorsal fin to hindmargin of caudal fin	6 m. 20 cm.
From anal opening to hindmargin of caudal fin	5 m. 80 cm.
From tip to tip of caudal flukes	4 m. 40 cm.
Length of pectoral fin from anterior axilla to tip	2 m. 50 cm.
Basal length of dorsal fin	2 m. 30 cm.
Length of anterior margin of dorsal fin	2 m.
Vertical height of dorsal fin measured from tip to base-line	50 cm.

Reduced to percentages of the total length the following figures are obtained:

The length of the pectoral fin in % of tot. l.	12,7
The height of the dorsal fin in % of tot. l.	2,5
The distance from tip of snout to hindmargin of dorsal fin in % of tot. l.	83,1
The breadth of the flukes from tip to tip in % of tot. l.	22,4

These percentages allow a direct comparison with the corresponding ones in the tables of relative measurements, which have been compiled by TRUE (20) with regard to North Atlantic Finners caught as well at the European as at the North American coasts. Such a comparison shows then that three of these measurements fall within the limits of variation of the North Atlantic Finbacks, but the fourth differs considerably, viz. the one expressing the distance between the snout and the posterior margin of dorsal fin. In European Finbacks this percentage varies according to TRUE (20) between 73,8—77,6, in American specimens between 75,5 and 79,5 and in the southern race 83,1. The percentage for the southern Finback is thus 3,5 % higher than the known maximum for the American and 5,5 % higher than the known maximum for European specimens. It is not opportune to draw too far reaching conclusions from a single fact like this, but it may indicate that the dorsal fin of the southern Finback has a more posterior situation.

This characteristic together with the differences in colour, or rather distribution of colour, which exist, and with regard to the baleen may sufficiently separate the Finbacks of the Northern and Southern Atlantic, at least as geographical subspecies. Whether this is corroborated or not by skeletal characteristics, I hope to get the opportunity to show in a continuation of this paper.

The Finback was seen all the year round off South Georgia but did not occur in great numbers. Usually 2—3 specimens were seen together.

Its regular haunts were the same as those of the Blue whale a few, 5—6 english miles off the shore between the land and the area visited by the schools of Humpbacks. The Finback is very quick in its movements and runs with great rapidity. During the winter it swims more at, or near the surface, so that sometimes the dorsal fin is visible for a long time above the water. It appears to be very restless at that time of the year and moves with so great speed that the whaling steamer which made 9 knots an hour could not overtake it.

The food consist of »kril», that is Euphausiids.

The spout of the Finner is higher, narrower and denser than that of the Blue whale, according to SÖRLING.

When it sounds it does not show the flukes and it stays as a rule below the surface 10—15 minutes.

The southern Finback is as a rule neither infested by *Cyamus* nor by *Coronula*, only one single specimen had some barnacles on one of the pectoral fins.

In consequence of its rapid movements it is not easy to get a good shot at the Southern Finback, and, if the harpoon has not hit well, so that the whale is badly wounded, the game is very unpleasant for the whaling steamer and its crew, and leads to no good result. A couple of examples of such kind may be told. One

Saturday at noon, SÖRLING relates, when I had gone along with the whaling steamer, we shot a Finner. The harpoon got a good hold, the engine was stopped, and the whale tugged away with the whole steamer with a speed of 3—4 knots an hour, and it continued to do so the whole Saturday afternoon and the whole night. On Sunday morning order was given to work the steam engine backward, but the Finner tugged away northward as before with hardly diminished speed. Finally steam was put on the winch too, for the purpose of shortening the line if possible, and diminishing the distance to the whale, so that a new shot might be tried. But all these efforts were in vain. Finally, towards Sunday noon, in consequence of the double strain on the harpoon, it loosened its grip and the whale got free and disappeared. At another opportunity the whaling steamer was tugged for three whole days by a Finback with similar result. With such experience it is no wonder that the whalers are not very eager to attack the Finbacks as long as they have other whales to hunt. This is the more reasonable as the Finback in spite of its size yields comparatively little oil. Usually it only amounts to 20—25 barrels. During the winter, SÖRLING found that the blubber coat on the flanks of a Finback was not thicker than about 3—4 inches, and that is not much for a whale.

Megaptera lalandii (FISCHER).

Syn: *Balæna Lalandii* FISCHER¹ 1829.

Balænoptera capensis A. SMITH 1834.

Poescopia Lalandii GRAY 1866.

Megaptera cf. *longimana* RACOVITZA 1903.

A skeleton of a halfgrown male shot off Cumberland Bay, South Georgia the 2d of Febr. 1905.

A male foetus, the mother of which was shot 8—9 miles off Cumberland Bay, South Georgia, the 28th of Febr. 1905.

Some pieces of baleen of adult Humpback.

The names of this list have all of them (except RACOVITZA's) been given to the Humpback of the seas of Cape of Good Hope, but this is no doubt identical with the one found at South Georgia, as will be further discussed below.

Humpbacks have been more often observed in southern waters and by the different antarctic expeditions than any other species of whalebone-whales. RACOVITZA (18) has given an admirable account of this to which may be referred. Although the »Belgica» Expedition did not catch any whales, the author quoted had the opportunity of repeatedly observing Humpbacks in a living state and on rather close quarters. RACOVITZA has therefore been able to record (18) approximative measure-

¹ FISCHER's diagnose is worded in the following way: »*B. Lalandii*; occipite gibbere instructo; pinnâ dorsali longissimâ fere super pectoralibus locatâ; vertebris quinquaginta tribus; cervicalibus (præter epistropheum cum tertia coalitum) liberis; costis (utrinque quatuordecim (tredecim *Desmoul.*); maniculi indice biarticulato.» This is of course incomplete and to some extent faulty, e. g. the description of the dorsal fin, but as FISCHER quotes in the first rank CUVIER's »Rorqual du Cap» (Oss. Foss.) as type and this is a *Megaptera* his name may be retained, because there is no doubt as to which animal it is to be referred.

ments of several specimens, as well as his observation of the colouration of numerous specimens of this whale together with notes on the habits of the animal.

At Captain LARSEN'S whaling station on South Georgia the Humpback was a common occurrence and SÖRLING had the opportunity of seeing about 75 such whales brought to the factory. The largest of these measured about 11 to 11,₅₀ m., the smallest 8,₁₅ in total length.

The former of these measurements agrees perfectly with the size of a specimen of this species which RACOVITZA (18) observed close to the ship. The author quoted believes, however, that he at other opportunities saw Humpbacks of considerably greater size, and he thinks that he has seen two specimens that might have been even more than 16—17 m. long. It must be observed to this that it is very difficult to estimate the exact size of a whale in the water. The present writer must therefore on the basis of SÖRLING'S measurements maintain that at least the Humpback of the South Atlantic as an average does not attain a larger size than about 11—11,₅ m. (36—38 feet) in length. SMITH has recorded the length of a specimen from Cape to 34 feet. In consequence of this, the Humpback of the southern Atlantic appears to be smaller than the northern. The south pacific Humpback may be different in this respect; conf. below the statements about the different colour as well. TRUE (20) has compiled statistics about the length of the northern atlantic Humpback and arrived at the conclusion that the average for »mature males» is at the American coast 46 feet 11 inches and at Finmarken 58¹ feet 11 inches, and for mature females resp. 45 feet 11½ inches and 48 feet. If from TRUE'S tables the average for all the specimens caught, of both sexes and all ages, is compared with the measurements from the southern Atlantic it may be found that the northern average measurements are nearly as large, or larger, than the maximum length of southern specimens. The average length for all Newfoundland specimens is namely 37 feet and 4 inches, for specimens from Finmarken 38 feet 3½ inches and for other European specimens 39 feet 5 inches. If all these measurements with certainty could be said to have been taken in the same way, it should, of course, have been fully proved that the northern Humpback is a larger animal, but as it is not excluded that the measurements have been taken differently, it is best, for the present, only to pronounce the probability of such a fact.

Concerning the colour of the Humpback of the southern Atlantic SÖRLING has communicated the following. The smallest (8,₁₅ m.) specimen he saw was all over dark slaty blue, almost black, except the inner sides of the pectoral fins which were white. The young animals were, as a rule, entirely blackish grey except the inner side of the pectoral fins and the under side of the flukes. The adult were marmorated on the under side of the lower jaw, throat and anterior part of the breast and on these parts the white is the ground colour on which irregular black spots are distributed, but in some instances the black is dominating. The inner side of the pectoral fin is white, most purely at its hind-margin but shading more and more to grey

¹ This is, however, probably a misprint for 48!

towards the anterior border of the inner side, the outer side being of the same colour as the upper parts of the body, that is blackish. The lower side of the caudal flukes is also white with scattered blackish spots.

RACOVITZA's (18) description of the colour of the Humpbacks observed by him does not quite agree with this. Although he has only seen the whales in the water it must be kept in mind that he has seen them on close quarters and has had good opportunities to study them so that he gives quite detailed descriptions. He says that the upper parts were black but the throat and belly white. The pectoral fins he found to be, to a great extent, white, below always white, »the upper parts often spotted with black.» The ventral parts of the caudal region varied, according to RACOVITZA, (18) very much in colour, being sometimes, but seldom, quite black, or quite white, usually spotted with white and black in variable degree in each individual.

Against RACOVITZA's description SÖRLING has emphasized that none of the 75 specimens he saw on land had anything white on the outer side of the pectorals and hardly ever any white on the under surface beyond the pectoral arch.

Once RACOVITZA (18) saw an albino specimen, ivory-coloured above and white beneath. The question now remains how to explain the strange discrepancy between the reports of RACOVITZA and SÖRLING concerning their observations about the colour of the Humpbacks seen by them. This discrepancy is namely too great to be disregarded, as both observers, of course, are fully trustworthy. I think there is no other way out of this difficulty than to assume that the whales seen by the two observers have belonged to two different geographic races with, to some degree, different colour. It is then to be remembered that RACOVITZA (18) has studied the Humpbacks chiefly in the waters to the west of the Graham land mass, (except some few seen in the Beagle Channel) and this area belongs naturally to the Pacific Ocean, whereas SÖRLING's field of observation at South Georgia belongs to the South Atlantic. It is not impossible that the Humpbacks of the southern part of both oceans belong to different herds or stocks which do not mix and have not done so for ages, if not exceptionally. In such a case two separate geographic races with some differences in colouration may have originated.

It is interesting to note that this difference is parallel to that between the Humpbacks of the northern and those of the southern Atlantic. The colour of the former is certainly variable, but, unlike the southern atlantic race, the northern has according to all authorities the pectoral more or less white on the upper or outer side, as well, and the white markings on the under surface of the body appear to extend further backwards, at least in many specimens. The colour of the northern atlantic Humpbacks thus agrees better with RACOVITZA's observations of the Humpbacks west of Graham land than with SÖRLING's at South Georgia. The young specimens in the North Atlantic are, however, as a rule darker with blackish throat and breast than the adult.

The furrows of the South Georgia Humpback have the same colour as the surrounding parts.

On a young specimen (8₁₅ m.) SÖRLING counted 24 furrows on the ventral surface of the breast. They begin at the chin and extending backwards they diverge somewhat on the breast, but converge again and become partly confluent on the middle of the belly in front of the navel (Pl. VI fig. 28). The longest furrows seem to end on a level with the hind-end of the navel, the lateral ones are shorter.

A similar number I have counted on a foetus (conf. Pl. IX). In the northern race the number of furrows, according to TRUE (20), varies between 14 and 22 on the American side of the ocean, and, according to SARS, between 20 and 30 on the European side. As the furrows do not run regularly but one furrow may sometimes be seen to divide into two and two to unite into one the counting is somewhat difficult and may lead to different results, if done according to different principles. The results to which different authors have come, cannot therefore be directly compared when it is not stated at which place the counting is done. The counting of the furrows of the southern Humpback, as quoted here, has been done just between the pectorals.

Concerning the number and situation of the dermal tubercles of the South Atlantic *Megaptera* SÖRLING has not made any notes, but two photos taken by him and reproduced here (Pl. VI fig. 25 & 26) throw some light on this. On the snout there are evidently as well lateral as median tubercles. The former are placed in an irregular row and are perhaps 8—9 in number. The median ones are distributed from the tip of the snout to the sides of the blow-hole. These tubercles of the upper jaw are not so well developed in a foetus (Pl. IX) measuring 1₄₅ m. in length. They may, however, easily be discerned, and their arrangement is shown on Pl. IX. They are evidently not quite regularly placed, but there may, nevertheless, be recognized some series and groups. Eleven tubercles of varying size form an irregularly wavy series along the lateral portion of the upper jaw. Five are found in a median row from the snout to below the boss in front of the blow-holes. A single tubercle is seen laterally from the same boss, and two more sit further back and higher up at the sides of the blow-hole.

It is of great interest to note that there sits a hair on top of each of these tubercles described, and sunk into them so that in some instances, where the hair itself has fallen out, the rather wide pore in which it had rested, remains.

The situation and arrangement of these hairs make it evident that they are the homologues of vibrissæ. In the adult the hairs seem to have disappeared as SÖRLING did not observe any on either jaw. This might prove to be a difference from the Humpback of the Northern Atlantic, which is said to be provided with such hairs even when adult.

With regard to the maxillary tubercles and their arrangement the northern and the southern form correspond fairly well, although TRUE, (20) and other authors quoted by him, mean that they could distinguish two lateral rows in addition to the median one, which is hardly possible in the southern atlantic Humpback in spite of that the number of tubercles (although varying) is about the same. The tubercles of the lower jaw of the southern atlantic Humpback form a cluster on either side

of the symphysis and extend from there in longitudinal rows along the mandible. These tubercles are still better developed in the foetus alluded to above and are there arranged in three rows, (comp. Pl. IX). The upper one of these, near the upper border and anterior end of the mandible, consists of 4 tubercles, then comes below and behind these a row of 3, and finally still lower, but extending from the symphyseal cluster and to below the posterior end of the second row a series of 6 or 7 tubercles (comp. Pl. IX). On SÖRLING's photos this arrangement is not quite so plainly visible, partly in consequence of the barnacles. Three rows on the mandible were also recognized by TRUE (20) on the Humpback from Newfoundland. The tubercles of the mandible of the foetus of the southern Humpback carried as well as those of the maxillary each a hair which in some instances, however, had not yet broken through the epidermis, although its tip made an elevation on the same, in other instances it was well developed.

The epiderm of these tubercles was smooth and similar to that of the surrounding parts of the skin and did not show such a rugged surface as some formations found in the Black whale, and which will be spoken of later on. It cannot be said anything with certainty about these tubercles as there has not been any material preserved for investigation. It appears, however, most likely that they have a sensory function as the development shows that hairs corresponding to vibrissæ originally are placed on, and in these tubercles, and they are too largely developed to be only rudiments of footstalls of former sensitive hairs or vibrissæ.

The baleen of the southern Humpback was quite black, SÖRLING says, except that »one single specimen showed some yellowish outer margins.» The samples SÖRLING has carried home are black, the coarser bristles at the tip are also black but the finer on the inner side become, more or less, light brownish in a median direction.

Scandinavian authors, like LILLJEBORG and SARS, describe the baleen of the northern Humpback as »greyblack» and the bristles as brown. STRUTHERS found anteriorly some of the baleen partly white. In a similar way TRUE (20) observed in one specimen from Newfoundland »the right whalebone — — — from the anterior end backward about one foot — — — dull whitish», and in another specimen, he says, »a few anterior blades of whalebone were white externally.»

With regard to the size of the baleen it may be recorded that the largest piece SÖRLING has carried home measures about 73 cm. in length or $28\frac{3}{4}$ english inches. TRUE (20) has compiled a table of measurements indicating not only the length of the baleen of Newfoundland Humpbacks according to his own observations, viz. 21—22 inches, but also the records in the literature about the same of European specimens viz. 20 to, approximatively, 24 inches. It would appear from this, as if the southern atlantic Humpback had comparatively longer baleen, especially if it is considered that the size of the whale itself is somewhat smaller.

The length of the bristles is, of course, variable, but the long ones on the middle of the median side seem to have an average length of 18—20 cm. (7—8 in.) and many are from 23 to 28 cm. (9—11 in.). The length of the bristles have not

been measured by TRUE (20), but he quotes STRUTHERS who says: »The hairs are fully 4 inches in length, some 6 inches.» The greater development of the baleen, as well the blades as the bristles, of the southern Humpback are no doubt of biological importance and stands in connection with the condition of the food which, SÖRLING says, consists entirely of Euphausiids (»kril»), while the northern race also feeds on fish (*Mallotus*, *Gadus saida* according to LILLJEBORG).

The dorsal fin is low, and at least in the foetus not falcate.

SÖRLING has not observed that the dorsal crest of the caudal region of the southern Humpback is denticulated as RACOVITZA (18) has described and figured from the western side of Graham land.

The shape of the pectoral fin of the foetus with its tubercles is presented on Pl. IX. It appears to agree essentially with the same of the northern race.

As TRUE (20) has shown for the northern Humpback, the flukes are already in the foetal stage notched and fringed by a series of processes with emarginations between them. When the same appearance of the flukes is found in the adult, it is evident that it cannot be ascribed to injury but is a natural character retained from the foetal stage. The same is proved with regard to the foetus of the southern Humpback by Pl. IX.

SÖRLING has taken some measurements of a young Humpback and two foetuses as the following figures show:

	Young ♂ shot 2½ 05 12—15 miles off Cumberland Bay.	Foetus ♂, the mother shot 2½ 05 8—9 miles off Cum- berland Bay.	Foetus ♀, the mother shot in the middle of March 1905 off Cumber- land Bay.
Distance from tip of snout to hind-margin of the middle of caudal fin in a straight line	8,15 m.	1,45 m.	1,23 m.
Distance from snout to beginning of dorsal fin	4,35 m.	98,5 cm.	75,5 cm.
Distance from snout to end of dorsal fin	5,28 m.	107,5 cm.	82,5 cm.
Distance from anterior border of axilla to tip of pectoral fin	2,56 m.	45,5 cm.	35,5 cm.
Length of base of dorsal fin	0,93 m.	9 cm.	7 cm.
Distance from beginning of dorsal to hind-margin of caudal fin	—	68 cm.	60,5 cm.
Distance from anus to hind-margin of caudal fin	—	58 cm.	39,5 cm.
Length of anterior margin of dorsal fin	—	7,8 cm.	7,5 cm.
Vertical height of dorsal fin	—	4,3 cm.	2 cm.
Distance from tip to tip of caudal flukes	—	43 cm.	36 cm.

From these measurements it may be concluded that the dorsal fin has a comparatively more posterior situation in the foetus than in the semi-adult, as its distance from the tip of the snout is in the latter only 53,3 % of the total length against resp. 67,9 % and 61,3 % in the foetuses. The corresponding percentages expressing the distance from the snout to the end of the dorsal fin are in the semi-adult 64,7, and in the foetuses resp. 74,1 and 67,0. The first and the last of these latter percentages fall within the limits of variation for the same relative measurement of the northern Humpback, as recorded by TRUE (20), although the percentage for the semi-adult southern Humpback is just at the lower limit of that of the northern. If any conclusion could be drawn from a single measurement like this, it would

be that the dorsal fin of the northern Humpback generally has a position which represents an ontogenetically earlier stage in the development of the southern race.

The length of the pectoral fin is in the semi-adult 31,₁ % of the total length, and in the foetuses resp. 31,₃ % and 28,₈ %. All these measurements fall within the range of variation of the northern Humpback, according to TRUE'S (20) tables.

The flukes are usually cut off before the whales are tugged in to the factory. SÖRLING had therefore only opportunity to measure the flukes of the foetuses. These are, of course, comparatively not fully as large as those of the adult animals. Their breadth from tip to tip expressed in percentage of the total length of the foetuses is resp. 29,₆ and 29,₂. According to TRUE (20) the same percentage in the adult northern Humpback varies from 30 to 38,₂ but in one american specimen sinks so low as to 27,₁. There is thus a very considerable amount of variation with regard to this organ.

When SÖRLING first arrived at South Georgia, in the middle of Nov. 1904, the Humpbacks were very numerous off the coast and continued to be so to about the middle of May 1905. Between the first of June, however, and the first of Oct. that year none was seen or shot. It is thus evident that the Humpback migrates from South Georgia somewhere and stays away during the winter.

The Humpbacks frequented especially the »bank» some 30—35 miles off the coast. They are gregarious and appear in small schools swimming back and forth. The Humpback shows a certain degree of curiosity and it often approaches the fatal whaling steamer as if to see what it is. In some places the Humpbacks appeared to be very numerous, so that their spouts were seen everywhere, all round the vessel. SÖRLING says, »the spouts rose all round us so that the sea could be compared with a field on which bushes grew.»

When the southern atlantic Humpback lies quiet at the surface it shows, according to SÖRLING, the protuberance around the blow-hole and the anterior portion of the back above the water, but not the dorsal fin.

RACOVITZA has published a photo in which the protuberance round the blow-hole and the dorsal fin, but not the intermediate portion of the back, are visible, it is thus apparent that such a position as well is possible in the Humpback to the west of Graham land.

When this species sounds it always shows the flukes, even if it only makes a short dive.

It stays below for 10—15 to 30 minutes.

Its spout is not very high. SÖRLING calls it »broom-shaped» in his notes. It is not by far so high as that of the Finbacks.

Of the 75 Humpbacks caught, only three were pregnant females. The first of these was shot the 28th of Febr. and its foetus (Pl. VI fig. 27) measured 1,₁₅ m. in length. About two weeks later the second was shot, and its foetus measured only 1,₂₃ m. in length. The third was shot some weeks later, but its foetus was not measured as it was spoiled before SÖRLING heard about it.

Although these notes are somewhat scanty it may be concluded from them

that the young Humpbacks are not born in the waters of South Georgia but somewhere else. It is said that Humpbacks come to Cape of Good Hope to bear their youngs there. Are these the same specimens which feed on the »bank» off South Georgia during the antarctic summer? This seems at least not impossible with regard to the time of the year, as I find, for instance, stated in W. L. SCLATER's book on »The Mammals of South Africa» (Vol. II pag. 183) the following passage: »Like the right whale the humpback seems to frequent the shallow waters of bays and inlets for breeding purposes, arriving in Table and False Bays in *the middle of the winter.*»¹ The Humpbacks appear thus at Cape at such a time of the year when there are none to be seen off South Georgia, and it is therefore possible that the migration takes place between these two areas.

There is another observation which is of some importance and throws some light on the propagation of this whale. The semiadult individual measuring 8,15 m. in length and shot the 20 of Febr. 1905 was still in company with its mother which was not pregnant. This appears to indicate that these whales do not have youngs every year.

All specimens of southern Humpbacks are beset with barnacles. The greatest numbers are found on the throat, and around the anus. Otherwise they are found almost everywhere, even on pectoral, dorsal and caudal fins. On the *Coronulae* often Conchoderms are found, but not always.

All the Humpbacks had also *Cyami*, except the young specimen of 8,15 m. length. The »lice» sit mostly in the furrows, at the chin and on top of the head, but otherwise scattered everywhere.

The Humpbacks are rather easy to kill. They are not shy so that they allow the whaling steamer to approach within suitable distance, or even swim up to it themselves. This allows the gunner to choose his chance for a good and deadly shot. The curiosity of the animals is also used by the whalers in such a way that when they have shot a Humpback and it is about half dead they do not haul it in to the vessel but leave it at the end of the line to dodge up and down. The movements of the poor dying creature attracts its fellows which swim up to see what it is and then fall easy victims to the harpoon-gun. Thus it happened once that Captain LARSEN could shoot and kill in one day not less than six Humpbacks which were tugged ashore at one time. The Humpbacks are very fat so that they float when dead. They have often a blubber coat measuring 10—12 inches in thickness, and a single Humpback yields about 25 to 30 barrels of oil. In addition to the subcutaneous blubber, which is thickest on the sides of the animal, the fat around the viscera is taken care of, and the tongue. This latter is, as also in the Finback and the Blue whale, very soft and loose almost gelatinous to its consistence.

¹ Italicised by the present writer.

Balæna australis DESMOULIN 1822.

1 adult skeleton and several anatomical preparates. 1 blade of baleen of a ♂ shot about 30—35 miles off Possession Bay, South Georgia the 7th of March 1905.

This whale was first known to science from the Cape seas, especially through CUVIER's description of the skeleton (in: Oss. Foss.). It has been much discussed whether the southern Black Whale should be identical or not with the Nord Caper of the North Atlantic. Some authors have even wanted to refer to one and the same species, as well the Black Whale of Australia and New Zealand as that of the Japanese waters. The latter cannot be discussed here as I have no material for comparison, but the Black Whales of the Northern and Southern Atlantic shall be compared to their exterior characters here, and more fully in a later treatise on their osteology.

During his stay at South Georgia SÖRLING had the opportunity of seeing 7 Black Whales shot and brought to the factory. They were all of them entirely dark, almost black, above and below, with the exception of two specimens. One of these latter had a small white spot below, just behind the left pectoral fin. The second had more extended white areas below, as the figure 33 on Pl. VII shows better than any description. Standing at the tail end SÖRLING has taken this photo of the upturned belly of the whale.

At the tip, as well of upper as lower jaw, hairs are found. They are light grey in colour and short, measuring from 12 to 40 mm. in length, and sit rather far apart. On the upper jaw these hairs are distributed from the tip of the snout to the anterior border of the »bonnet». The arrangement is shown on fig. 41 Pl. X. On the lower jaw the hairs are distributed over a wider area. A sample from this region is shown in fig. 42 Pl. X.

The baleen is black.¹ SÖRLING counted 214 blades on either side of the upper jaw in the first caught specimen, which had a total length of 14,10 m. and the skeleton of which was preserved. The foremost blades were only about 4 cm. long, but they increased rapidly in length to 195 cm. then they decreased again towards the interior of the mouth. This measurement 195 cm. is counted from the surface of the gum to the tip, but then the blades are deeply implanted in the gum so that the full size of the longest blades was 218 cm.

A female specimen shot the 12th of May had some »twin»-blades of baleen, that is two blades grown together as if soldered. One such »twin» blade of 2 m. length weighed 4½ kilogr. and its basal thickness was 3 cm.²

¹ Occasionally specimens are found which shade into bluish slate or still lighter towards the median side. The lighter colour is then present in the shape of stripes as in the baleen of the Finback.

² At the base of each such »twin»-blade between the same and the next normal blade pathological structures of a very peculiar appearance were found. These may correspond to through disease deformed baleen. The centre of each such structure consists of a transversally placed excrescence protruding about 7 cm. from the gum and about 1½ cm. in section. This may correspond to the basal papilla of a blade of baleen (Pl. X fig. 43). Its surface is densely and completely covered by a mass of narrow digitiform pro-

In another male specimen which had a total length of 15,21 m. the baleen was »about 20 cm. longer» than in the first measured specimen, SÖRLING has written in his notes. The baleen of that one should thus have reached a length of about 238 cm. The baleen should in the latter case have been thicker and provided with longer hairs as well.

The hairs fringing the inner side of the blades is black, very fine and soft. Each blade of baleen is very narrow (Pl. VIII fig. 39) and pointed, the basal breadth of a blade measuring about 180 cm. in length is only about 18 or perhaps 18½ cm. Although the texture of the baleen is very fine, the blades are rather thick, but the thickness is very variable, even in the same blade. The inner edge is thicker than the outer, and in addition to this some portions are thicker than others. In a blade measuring about 180 cm. in length so different measurements of the thickness of the proximal half may be obtained as from 6 to 10 mm.

The length of the baleen of the southern Black whale is comparatively very great. In the two instances quoted above it amounts to resp. 15,4 and 15,6 % of the total length of the whale itself.

According to the absolute measurements communicated by TRUE (20), the corresponding percentage for the largest North American Nordcaper (53 feet long) recorded in the tables of this author should be about 13,3. For another smaller Nordcaper from Charleston the same percentage was 10,7. From European Nordcapers TRUE (20) has only obtained two such relative measurements giving a percentage of 6,6 and 7,1 resp. and these were taken from specimens of approximately the same size as the Charleston whale, one of them being 3 feet longer, and the other 1 foot shorter than the latter. Concerning this TRUE (20) remarks: »It will be observed that while in the young European specimens the proportional length of the whalebone falls below that of the American specimens, nevertheless, the largest Iceland whalebone equals or exceeds that of the largest American specimen. While the discrepancies above mentioned are not explainable at present, it appears that adult European and American specimens have whalebone of equal length.»

Although it thus exists a discrepancy with regard to the relative dimensions of the baleen of the Nordcaper on both sides of the North Atlantic it appears to be stated that a larger = older specimen has even comparatively longer baleen than a smaller = younger. When thus the two southern Black whales, the measurements of which have been recorded above, have not attained such a size as the largest of TRUE'S American Nordcapers but, nevertheless, the one has absolutely longer and the other nearly as long baleen, and the baleen of both is, comparatively, a good deal longer than that of the larger American Nordcaper, it may be concluded that

cesses, the longest of which attain a length of 11—13 cm. and have a thickness of 3—8 mm. Some of these are pointed at the tip, others are rounded, some are even, some nodose or otherwise irregular. In the base of at least the thickest ones cutaneous prolongations extend from the central papilla. The processes themselves are of epithelial origin and correspond to baleen, but they are loose and brittle and in a state of dissolution as if they were rotten. They smelt very badly from the first, SÖRLING says, and even preserved in alcohol they have a bad smell like rotten horn.

the southern Black whale, in all stages, is provided with a comparatively longer baleen than its northern relative.

SÖRLING has taken some few other measurements of two adult southern Black whales and a foetus of the same species. These are communicated in the following table:

	♂ ad. shot off Possession Bay, South Georgia, $\frac{7}{3}$ 1905.	♂ ad. shot off South Georgia $\frac{14}{3}$ 1905.	♀ foetus, the mother shot off Cumberland Bay, South Georgia $\frac{12}{5}$ 1905.
Distance from tip of snout to hind-margin of caudal fin in a straight line	14,10 m.	15,21 m.	4,19 m.
Distance from anal opening to hind-margin of caudal fin	4,40 m.	4,57 m.	1,74 m.
Length of pectoral fin from anterior border of axilla	2,42 m.	2,80 m.	0,82 m.
Distance from tip to tip of flukes	5,43 m.	5,66 m.	1,47 m.

It is of interest to compare these measurements when reduced to percentages of the total length with the corresponding ones from the Nordcaper.¹ This is facilitated by the tables published in TRUE'S (20) valuable work on »the Whalebone Whales of the Western Atlantic». There are recorded, for instance, the relative dimensions of the pectoral fin of no less than six¹ Nordcapers as well from european as american coasts, and the percentages expressing the length of this organ compared with the total length of this animal is found to vary from 14,0 to 16,3. The corresponding percentages for the southern Black whale as represented by the three specimens measured above are resp. 17,1; 18,4 and 19,5 (the foetus). Consequently not one of these fall within the range of the known variation of the Nordcaper. The discrepancy thus found is the more important as TRUE'S calculations have been obtained from so many as six specimens of a length varying from 26,9 feet to 48 feet, and mine from two adult specimens as well as from a foetus. It is evident from this comparison that the southern Black whale is provided with longer pectoral fins than the Nordcaper. The shape of the pectoral fin of the adult southern Black whale is seen in Pl. VII fig. 32. The outline of the same organ of a foetus is represented in fig. 4 A. A comparison of the breadth of the caudal fin from tip to tip of the flukes leads to a similar result as the comparison of the pectorals. According to TRUE (20) the percentage expressing the measurement of breadth of the flukes compared with the total length of the Nordcaper varies in 9 specimens from 27,3 to 35,4. In the three specimens of southern Black whale the same percentage is resp. 38,5; 37,2 and 35,0 (the foetus). This indicates larger flukes in the latter than in the Nordcaper. The shape of the flukes of a foetus of the southern Black whale is represented in fig. 4 B. The other measurements are not, I regret to say, directly comparable, but I think that those already quoted may be sufficient to prove that the Nordcaper and the southern Black whale are not wholly identical, even if they are nearly related.

The length of the male organ of the Black whale first shot (tot. l. 14,10 m.)

¹ A seventh is as uncertain not counted here.

was 1,80 m. (Pl. VI fig. 29). In the same specimen the distance from the end of the tail to the pelvic bones was, measured in a straight line, 4 m. 23 cm.¹

Every specimen of Black whale examined, and, no doubt, every specimen existing, had on top of the head the peculiar excrescence known among whalers as the »bonnet». It is well conspicuous in situ in the figures 30, 31, 32 and 34 on Pl. VII

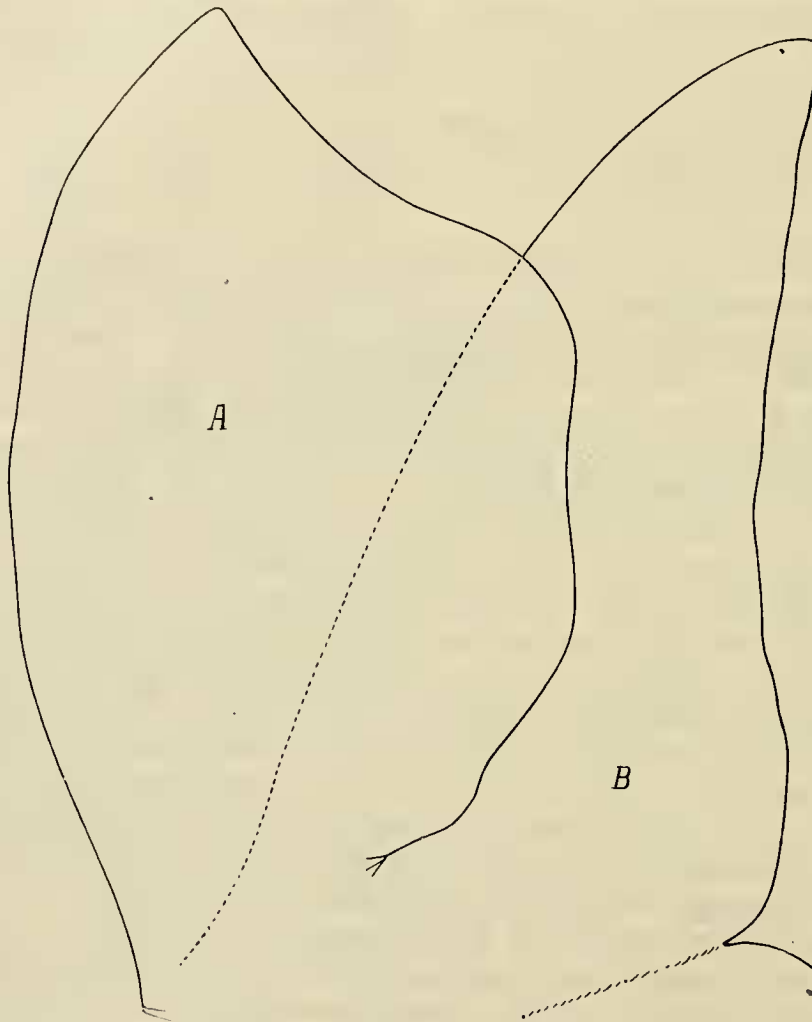


Fig. 4 *A*. Outline of the pectoral fin of a foetus of southern Black whale; *B* Outline of one of the caudal flukes of the same, reduced to less than $\frac{1}{6}$ nat. size.

although the whales in all these figures are represented lying on their back. It may be concluded from these figures that the »bonnet» has a considerable size. A vertical section through the »bonnet» somewhat to the side of the median line is reproduced in $\frac{1}{2}$ nat. size on Pl. X fig. 44 and the same piece cut off through this section, and seen from above is represented in Pl. XI fig. 45 in about $\frac{2}{5}$ nat. size. Through these two figures it may be proved that the »bonnet» is not only on excrescence of the epiderm but that its base and centre are formed by a thick cushion of coarse fibrous connective tissue belonging to the subcutaneous layers and of course containing a lot of fat or blubber as well. At the upper surface of this central cushion the cutis emits very long and slender, closely set papillæ into the black epidermis. The length of these papillæ, on this vertical section which is parallel with them, varies between 3 and 18 mm. and the variation in length stands of course in connection with the depth of the epithelial layers in each place. On top of this stratum, which contains these long papillæ, follows a layer of unmixed and completely black epiderm. But in consequence of the fact

¹ Full descriptions and figures of these bones will be published in a later report together with the report on the osteology of this species compared with that of the Nordcaper.

the epithelial layers have been built up, so to say, round the long and slender papillæ it follows that even the epithelium on top of the papillary layer has a kind of fibrous texture. This has also been stated by RIDWOOD who has made a microscopic examination¹ of the structure of the »bonnet». The long papillæ, and the, by them produced, fibrous texture of the epithelial layers constitute nothing strange or aberrant in themselves. Similar structures are found a little everywhere in the mammalian series, in such cases when thick-epithelial resp. horny layers must be produced. The long papillæ from the cutis are necessary as well for nourishing the epithelial strata during their luxurious growth as for the sake of firmly attaching the epithelial organ, what it may be, a horn, a hoof etc., to the underlying cutis. And the fibrous texture of the epithelial derivatives is simply, as already stated, a necessary result of the mode in which the growth has taken place round the nourishing centres which the papillæ constitute. But if, so far, the »bonnet» does not exhibit any peculiarities, its exterior shape and structure are very strange, and at the same time its possible function and the cause of its existence are very mysterious. As is elucidated by the figures 44 on Pl. X and 45 on Pl. XI the »bonnet» has a very rugged surface. It is deeply pitted and honeycombed, and the pits and holes are very irregular with regard to size, shape and depth. In the living animal these holes are filled with, and the whole

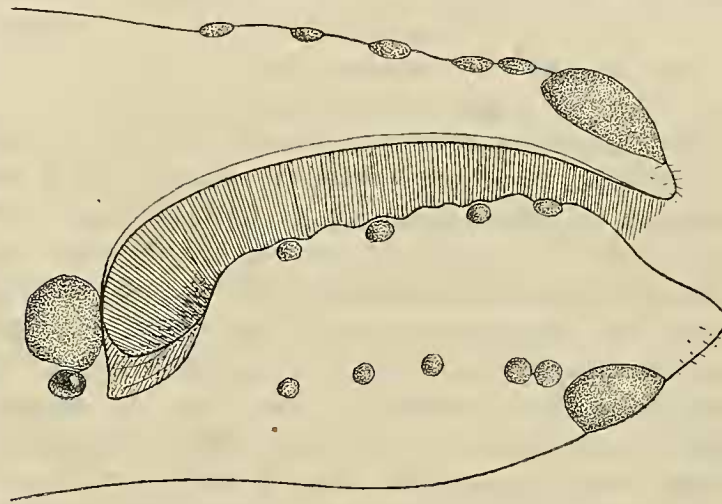


Fig. 5. Diagrammatic sketch to show the arrangement of the excrescences of the head of the southern Black whale.

»bonnet» covered by a immense crawling mass of countless numbers of »lice», that is *Cyami*. In the photographed specimen most of them have been shaken off to allow the structure of the organ to be visible, but many remain, as can be seen. There are, however, no other parasites to be seen besides the *Cyami*.

Behind the »bonnet» sits on the upper jaw a series of a good deal smaller excrescences arranged on either side as the accompanying diagrammatic sketch (made by SÖRLING at South Georgia) shows. In the original to the sketch these excrescences were five in number. One of them was cut out by SÖRLING and preserved and has been reproduced photographically Pl. XI fig. 46. The actual diameters of this sample piece are resp. 17 and 12 cm. As was the case with the »bonnet» great masses of *Cyami* cover this excrescence as well. But in addition to them the smaller maxillary excrescences contain a kind of barnacles which are quite deeply sunk into

¹ Proc. Zool. Soc. London 1901 p. 44.

the skin. These barnacles (*Tubicinella*) had, when alive and fresh, a fine pink and yellowish colour, SÖRLING says. Round the barnacles the epidermis is hypertrophied so that it protrudes like more or less complete tubes which may reach a height above the shell of the barnacle of up to 3 cm. As the walls of these tubes are rather thin from 2 to 4 mm. they are seldom quite complete but usually broken off at one side. But even in other places where no barnacles are found the surface of the excrescences is pitted and jagged, and at least on one side, the sample piece rises 3½ cm. above the surface of the surrounding skin.

These maxillary excrescences are also to be seen on Pl. VII fig. 30, 31 and 32. Their size is somewhat variable and it seems as if the hindmost were the largest. In addition to these more or less regular or irregular series on either side of the upper jaw, there appears to be a rather large excrescence just behind the blow-holes (Pl. VII fig. 30 & 32).

Just above the eye is a very wide excrescence of a similar kind (Pl. VII fig. 30 and 31, conf. also textfig. 5).

Near the end of the mandible there sits on either side of the lower jaw and rather widely apart (conf. Pl. VII fig. 34) a very large excrescence and from that one extends backwards along the jaw a row of about 5—6 smaller excrescences the situation of which is shown as well on the sketch fig. 5 as on Pl. VII fig. 30 and 34. Their size is a little variable but they are larger than the members of another series of similar excrescences which are placed at the upper margin of the lower lip (conf. the diagram fig. 5). This margin is a little undulated but the situation of the labial excrescences do not seem to have anything to do with this scalloped appearance. The number of the labial excrescences is in the original of the sketch (fig. 5) four but on the reproduced photos the number appears to be somewhat larger and is perhaps to some degree variable.

All these excrescences are in the adult animal the haunts of innumerable quantities of »lice» (*Cyami*). It could therefore easily be supposed that they were themselves to be regarded as results of the irritating influence of the »lice» on the skin of the whale, a hypothesis which has been forwarded before.

Against such a hypothesis speaks, however, the fact that the excrescences are already present in the uterine foetus, although they have then a smooth surface. Their actual presence is proved by the photo of the head of such a foetus reproduced in fig. 35 on Pl. VII. This is a very important discovery and it proves that the »bonnet», and the other excrescences on various parts of the head, of the Black whale are not pathological structures. BEDDARD has suggested in his »Book of Whales»¹ that the »bonnet» could possibly be »a pathological structure, a kind of corn, perhaps produced by the animal rubbing itself against rocks, as this species has been observed to do in order to get rid of the barnacles which are apt to infest it.» This opinion cannot be accepted any longer. Just as little can it be believed that the »bonnet» is a product of barnacles of the genus *Coronula*, as also has been

¹ London 1900.

hinted at, partly because no *Coronulæ* are present in the »bonnet» and partly because the »bonnet» is developed already in the uterine foetus. If an explanation shall be tried, there are two things which ought to be explained, the origin and the function. With regard to the origin, it lies near at hand to compare the serially arranged excrescences of the upper as well as the lower jaw of *Balæna australis* with the tubercles of *Megaptera* which have a similar situation and, at least in the foetal stage a similar appearance. As the tubercles of *Megaptera* carry hairs, at least in the foetus, they have above been regarded to be, at least from the beginning, footstalls of vibrissæ. From such an origin the tubercles might have become enlarged when their function was altered. *Megaptera* carries a cluster of tubercles at the end of the lower jaw. The large excrescences at the end of the mandible of *Balæna australis* might correspond to such clusters which secondarily when enlarged have become united. And perhaps the »bonnet» has originated in a similar way. If this explanation as to the origin is correct it remains to guess what function these organs may have now, because they cannot be sensory organs with such a structure, that is quite impossible. As the »lice» in vast amounts cover these excrescences, it lies near at hand to guess that there is some important connection between the excrescences and the *Cyami*. It has already been proved that the former cannot be entirely pathological products caused by the latter, but the rugged surface might be the result of the irritation of the epizoa which could have caused hypertrophy of the epithelial layers of the tubercles. On the other hand, the question offers itself: »Are the *Cyami* really parasites and in what respect and to what extent can they be such.» The *Cyami* have not a suctorial mouth as would be expected of parasites. They have no organs with which they could bore through the thick and solid epiderm of the Black whale — which in the samples of skin preserved by SÖRLING has a thickness of about 8 mm. — for the purpose of sucking the blood of their host. What harm can they then do? If they should gnaw themselves through the epiderm there ought to be wound and scars. But there are none such. Perhaps the *Cyami* are then only harmless scavengers which feed on the natural offal of the skin of their big host and, perhaps, they might even be useful to him. This usefulness might then consist therein that they kept his skin clean, and, especially, that they delivered him from larvæ of Cirripeds which otherwise might attach themselves to the skin of the whale and then grow out to great masses which gradually could be large enough to hinder his free movements and progress through the water. It is well known in which a high degree ships might be impeded in their speed by cirripeds, and it is also well known that barnacles, especially *Coronulæ* fix themselves on whales and then secondarily Chonchoderms on the shells of the barnacles. If the *Cyami* should really be able to prevent that, they would, certainly, be of great service to the whales, and it would be well if the latter could offer places where their not parasitic but usefully symbiotic *Cyami* could be protected. It might therefore be put up as a hypothese that the excrescences spoken of above have been secondarily adapted to be domicilia for the *Cyami*.

This is a daring hypothese as to the function of the tubercles and excrescences

and, I admit, that it speaks strongly against the same that some *Tubicinellæ* may be found in the midst of an excrescence together with a quantity of *Cyami*. As, however, the older hypotheses concerning as well the origin as the function of the »bonnet» have proved incorrect and no other or better than this one has presented itself to my mind, I thought I might just as well express it, as it might, perhaps, lead to advancing some still better and more satisfactory theory about these problematic structures.

The first Right whale observed by Captain LARSEN and his men was a young animal estimated to have had an approximate length of 8 m. When observed first it was seen near the shore basking among the kelp. It was not caught because it kept so close to the rocky shore that it could not be pursued with the whaling steamer for fear of wrecking the latter. This happened the 22d of Febr. 1905. After that almost every week Black whales were observed till the 24 of July when the last was seen.

The southern Black whales do not appear in large schools, but they like nevertheless to keep company, 2—3 and even as many as 5—6 were sometimes seen together, as SÖRLING has reported. As a rule they were found out on the »bank» among the schools of Humpbacks.

When the southern Black whale comes to the surface for the purpose of breathing, the surrounding parts round the blowhole are, during the expiration, prolonged to a protuberance, as is beautifully shown on fig. 20 Pl. V which is a reproduction of a photo taken and kindly communicated by Captain LARSEN. The double, right and left, spout is also shown on the same. When the Black whale is not disturbed, but quietly feeding among the »åt» — that is the plankton organisms that serve it as food — it »blows» several times with short intervals, as many as 8—12 times en suite, only quietly just as sinking down below the surface between each blowing. When it is calm it can be seen swimming under the surface during these short intervals. Then it sounds deeper and goes down showing the flukes above the water. When it sounds after showing its flukes it stays below the surface from at least 20 to 40—60 minutes.

The southern Black whale is comparatively slow in its movements and, although it is not exactly a shy animal, it is very easily scared by the noise of the screw and engine. If it has perceived anything, it sounds and disappears from shooting range and it is therefore not easily approached by the whaling steamer. When shot it becomes very nervous and troublesome and without wilfully attacking the whaler it might become dangerous. One specimen of those shot while SÖRLING was at the South Georgia station smashed the bulwark of the whaling steamer.

When lying quiet at the surface it shows the boss at the blowhole, and the posterior part of the back above the surface, according to SÖRLING's observations.

Its food consists of »kril» (Euphausiids).

It is very fat so that the blubber-coat of a Black whale in good condition has a thickness of 17 inches on the sides above the anus, and is still thicker, although less oily towards the back. Such a whale yields 40 barrels¹ of oil.

The tongue, which may be seen on fig. 34 Pl. VII, is not so gelatinous and flabby as that of the Humpbacks and Rorquals but much firmer, having about the same consistency as blubber.

A dead Black whale explodes, or bursts open, after about 24 hours with a tremendous force so that pieces of the entrails are thrown far and wide.

Concerning the propagation and the migration of the Black whale of the southern Atlantic it is of course difficult to say anything with certainty after the experience of only one year, but there are, however, some hints given. The only pregnant female of Black whale shot at South Georgia during SÖRLING's stay was killed the 12th of May and its foetus measured 4 m. 19 cm. (conf. Pl. VII fig. 35). It could not have lasted such a long time before a foetus of that size must have been born. On the other hand, it does not appear probable that the Black whales of the southern Atlantic bring forth their young in the cold and stormy seas of South Georgia when it is known that Black whales in other regions for that purpose seek more temperate and sheltered places. It is not improbable therefore, that the disappearance of the Black whales from the South Georgia waters towards the middle of the winter has something, at least partly, to do with the propagation. If I remember right I have heard Captain LARSEN say that during the winter the Black whales appeared to move, all of them, in a certain and the same direction, viz. NE. This might perhaps be put in connection with the fact that Black whales come »into Table and False Bays in June and July for the purpose of calving.»² It may, with the present scanty knowledge, perhaps be a little too rash to assert how the migration actually goes, but it seems at least possible that when the Black whales leave the Cape seas in spring they go south and then gradually work westward. In the antarctic autumn they have come so far west that, when they return east to Cape again, they pass west and north of South Georgia. — It must be remembered that the first Black whale was seen at South Georgia at the end of February. — This theory agrees also quite well with the common belief among whalers that there must be somewhere on a more southern latitude than South Georgia a »bank» on which the Black whales feed during the antarctic summer.

¹ Empty kerosene barrels were used for storing the oil.

² W. L. SCLATER: Mammals of South Africa II p. 181.

Birds.

Already the naturalists accompanying COOK, Messrs. FORSTER and Dr. SPARRMAN noted the richness of birds in South Georgia. SPARRMAN mentions for instance in his narrative that »thousands» of shags nested on small islands and rocks near Possession Bay. »A dozen», »Patagonian Penguins» (King-penguins) were observed on the shore. Other sea-birds swarmed round the vessel and a »lark» (read: »pipit») was heard singing, but SPARRMAN says »perhaps it was a straggler from the Falklands.»

The first important report about the bird-life of South Georgia was, however, delivered by the German Expedition 1882—83 and published by PAGENSTECHE (1) and VON DEN STEINEN (12). In these papers 22 (23?) species of kinds are recognized as inhabiting South Georgia and 18 or perhaps 19 are recorded as breeding there.

The Swedish Expedition 1902 (8 & 9) added to the breeders *Diomedea exulans*, and *Priocella glacialis* was added to the list of visitors.

SÖRLING has added *Oceanites oceanicus* to the list of breeders so that this list now contains 20 species, or 21 if *Daption* really breeds there as is most probable. Among the visitors *Thalassoeca antarctica* and *Thalassogeron culminatus*, have been observed, and perhaps also *Sterna hirundinacea* may be accepted as such, although it is not yet stated.

If *Pelecanoides exsul* is a distinct species it certainly is found at South Georgia. In such a way the number of species which more or less belong to South Georgia has increased to 29, but then the occasional stragglers are included.

If the avifauna of South Georgia shall be compared with the same of other subantarctic and antarctic districts the breeders must of course be considered in the first rank. They are:

<i>Aptenodytes patachonica.</i>	<i>Prion banksi.</i>
<i>Pygoscelis papua.</i>	<i>Pelecanoides urinatrix.</i>
» <i>antarctica.</i>	<i>Diomedea exulans.</i>
<i>Phalacrocorax atriceps.</i>	<i>Phoebetria fuliginosa cornicoides.</i>
<i>Oceanites oceanicus.</i>	<i>Nettion georgicum.</i>
<i>Garrodia nereis.</i>	<i>Sterna vittata georgica.</i>
<i>Fregatta melanogaster.</i>	<i>Larus dominicanus.</i>
<i>Majaqueus æquinoctialis.</i>	<i>Catharacta antarctica.</i>
<i>Pagodroma nivea.</i>	<i>Chionis alba.</i>
<i>Ossifraga gigantea.</i>	<i>Anthus antarcticus.</i>
<i>Daption capensis.</i>	

Of these *Nettion* and *Anthus* are endemic as species, and *Sterna vittata georgiae* as subspecies.

Another group of breeders is exclusively confined to the American quadrant of the subantarctic, resp. antarctic region. To this group belong *Pygoscelis antarctica*, *Phalacrocorax atriceps* and *Chionis alba*. Of these the first and the last are, when on South Georgia, at their northern limit as breeders. *Chionis* and *Phalacrocorax atriceps* are fully at home even in the southernmost inhabitable parts of the antarctic region but *Pygoscelis antarctica* has a more restricted habitat from western Graham land and the South Shetlands to the South Orkneys.

The remaining lot of birds breeding on South Georgia have a very wide distribution and are more or less completely circumpolar. But some of them do not extend further south at all, while others also are found within the true Antarctic region. Of the latter some are also circumpolar within the Antarctic region, while others extend so far south only in the American quadrant, as K. A. ANDERSSON (8) has remarked as well, and otherwise have a wide distribution only in the Subantarctic region.¹ The cause of this is, no doubt, that nowhere else subantarctic and antarctic lands and islands are situated so near each other. The same has also caused that some truly antarctic birds in this quadrant, but nowhere else, extend northward into the subantarctic region, for instance *Pagodroma*.

The non breeding birds may be divided in normal visitors and occasional stragglers. To the former group belong for instance *Priocella glacialisoides*, *Diomedea melanophrys* and *Thalassogeron culminatus*. All these are circumpolar.

Thalassoeca antarctica is less often observed, it has a wide antarctic distribution.

The specimens of *Eudyptes* which were observed by the German Expedition were certainly occasional stragglers, perhaps from the Falklands.

The avifauna of the South Orkneys has recently become well known through the Scottish Expedition (21) and, as these islands are the nearest land of any importance, it is of special interest to compare their ornithology with that of South Georgia. The first look will then show that the South Orkneys is much poorer in breeding species. In addition to the endemic birds, the following South Georgian breeders are missing at least as such on the South Orkneys: *Aptenodytes patachonica*, *Garrodia nereis*, *Majaqueus æquinoctialis*, *Prion banksi*, *Pelecanoides urinatrix*, *Diomedea exulans*, *Phoebetria fuliginosa cornicoides*. On the contrary, the South Orkneys possess only two breeding species which are not at home on South Georgia, viz. the true antarctic *Pygoscelis adeliae* and the south-american *Sterna hirundinacea* which appears to extend even further south. *Pygoscelis antarctica*, *Pagodroma* and several other species are, however, much more numerous on the South Orkneys than on South Georgia. Possibly *Eudyptes chrysolophus* and *Thalassoeca antarctica* also breed on the South Orkneys. Among the regular visitors of the South Georgia sea *Diomedea melanophrys* and *Thalassogeron culminatus* appear to be missing at the South Orkneys.

¹ *Pygoscelis papua*, *Catharacta antarctica* and *Larus dominicanus*.

The avifauna of the South Shetlands and Graham land resembles that of the South Orkneys. *Priocella glacialis* is added (8) as breeder, the stately Emperor penguin is also to be seen there, but *Fregatta melanogaster* is to be subtracted, from the list. Otherwise the conditions are, on the whole, similar.

Kerguelen land has only circumpolar species in common with South Georgia. Its fauna is richer, and it has also its own endemic species.

In the following the birds of South Georgia are enumerated and notes on their habits are communicated from SÖRLING's observations with references to other authors. But before this is done, it is too tempting to be avoided to make with a few words a comparison between the bird-life at the northern and southern extremes of the Atlantic hemisphere, the Pacific being entirely left out not to complicate matters. It is axiomatic that the analogies in climatic and other conditions that exist between the Arctic and Antarctic shall produce and offer to some extent similar conditions of life for sea-birds at the opposite poles. Broadly speaking there are also two, and biologically the same, types which have found the best opportunity to develop in these icy regions of the North and the South, and these are that of the longwinged bird with great flying capacities and that of the shortwinged diving bird which uses his wings as oars when swimming below the surface. The place of the former type is in the Arctic chiefly occupied by the *Laridæ* (+ *Fulmarus*) and in the Antarctic by the *Tubinares* (+ a gull and a few terns). The place of the latter type or that of the short-winged diver is in the South taken in possession by the penguins, which have become so extremely specialised for this mode of life that their wings were transformed to flippers and they entirely lost the flying-capacity. — The reason why this could happen without risk was of course the complete absence of terrestrial foes, land mammals, such as polar foxes etc. — In the Arctic the auks turned to an analogous mode of life, but although they certainly became specialised as divers they could not be without their flying capacity, for this was well needed because they had terrestrial enemies which threatened them and their eggs and offspring with destruction and forced them to breed on inaccessible ledges of cliffs and rocks, and in such localities the wings were absolutely needed to carry the birds to and fro the nest. But when the flying capacity of the wings must be retained the birds could not increase in bulk so much as was the case with some penguins. The correspondence between bulk and flying-capacity is clearly demonstrated by the now extinct Great Auk, which at the same time proves that the *Alcidæ* were able of developing large and bulky birds like penguins, but then at the cost of the power of flight.

The avifaunas of the arctic and antarctic parts of the Atlantic hemisphere have hardly anything in common with each other. In the north *Laridæ* and *Alcidæ* dominate in the south *Tubinares* and *Aptenodytidæ*. Some terns and a gull extend into the Antarctic region but they are not identical with those of the Arctic. One only of the numerous *Tubinares* (*Fulmarus glacialis*) has reached the far north, but the same is differentiated from its southern allies. *Alcidæ* and *Aptenodytidæ* are wholly confined each to its own polar centre. The difference makes itself sharply

known in many other remarkable features. No member of the loons, or of *Fuligulidæ* has found its way to the far south. The Antarctic has the unparalleled *Chionis* entirely as its own, but it is certainly very strange that no single member of *Charadriidæ* has reached the Antarctic region, although these birds breed at very high latitudes in the north and are very strong on the wing so that they on their migrations touch comparatively more southern localities than most other migratory birds. The Antarctic lands and islands are much poorer with regard to the vegetation, and are, and have been more completely isolated from the nearest continents and this has resulted in the complete absence of terrestrial mammals of all kinds. They are not even provided with endemic rodents like the polar hare and the lemmings of the north. Likewise they are for the same reason wholly destitute of herbivorous and graminivorous birds like the geese, ptarmigans, snowbuntings etc. of the Arctic. In consequence of this, birds of prey of all kinds are wanting. Neither snow-owls nor gyrfalcons haunt the Antarctic region, nor are there any other analogous species as such birds would not have been able to find any suitable prey. Such things are very easily understood, but it is more difficult to perceive why the cormorants, which in the south have pushed so far forward that they reach the extreme limits of bird life, for instance in the Graham Land complex, and on neighbouring islands, why these birds have not been able to spread more in the Arctic portion of the Atlantic, although they have reached the threshold so to say in West Greenland. The same is the case with the great skuas. In the South two species live within the true Antarctic, but the northern species is contented to keep itself in more temperate regions, and leaves the true Arctic to its smaller and weaker congeners, which, on the contrary, are not represented in the south.

If the arctic and antarctic avifaunas are compared from a biological point of view several rather striking analogies of biological types, so to say, present themselves. The biological likeness between the auks and the penguins has already been alluded to. The extinct Great Auk could favourably be compared for instance with a King-penguin, and the Razorbill, Guillemot, Puffin and so on, although they for reason already mentioned, are not fully as large, may biologically correspond to the smaller kinds of penguins. To the smallest of the auks, the little *Alle alle* of the north there is a beautiful biological analogy found in the south, although not among the penguins, but among *Tubinares* viz. *Pelecanoides*, the exterior of which as well rather strikingly resembles that of the *Alle*.

The Ivory Gull of the north and the Snow Petrel (*Pagodroma*) of the south are rather similar to the exterior in their snowy white dress, and in their habits, both of them pushing further than their resp. congeners into the ice-regions. The Giant Petrel surpasses certainly in size, strength and greediness the Burgomaster (*Larus glaucus*) but the latter plays nevertheless similar parts in its arctic home. That *Fulmarus* and *Priocella* can be compared, even biologically, is nothing remarkable as both are related as well. Between the Cape Petrel (*Daption*) and the Kittiwake (*Rissa*) there is no relationship but a certain biological analogy.

Without stretching this comparison any longer the above may be sufficient as an example of how biological parallels, and to a certain extent structural parallels may be developed from quite different sources in consequence of similar conditions offering similar chances for existence.

Anthus antarcticus CABANIS 1884.

- ♂ Moraine Fjord, Cumberland Bay the 30th of March 1905. »Iris black.»
 ♂ The same locality the 6th of Aug. 1905.
 ♂ (skeleton) found dead in the Moraine Fjord, Cumberland Bay the 24th of Dec. 1904.
 ♂ (skeleton) found dead in the West-fjord, Cumberland Bay, the 12th of March 1905.

These specimens agree with each other with regard to the colour of the plumage. The white of the outermost tailfeather varies somewhat in extent and intensity, the second tailfeather is slightly tipped with white in all specimens, but in a different degree in different specimens. The plumage is very thick in all three specimens but especially in the one shot in August. The feathers in the middle of the back of this one attain a length of about 4 cm. and the others in proportion to this. This thick wintercoat is of course an adaptation to the severe climate of the island which this hardy little pipit does not try to evade through migration. Length of wing 82—84 mm.

The Pipit of South Georgia was already at the first discovery of the island observed by the naturalists accompanying Capt. COOK, MESSRS. FORSTER and Dr. SPARRMAN, who spoke about it as a lark. The Antarctic Pipit has always been the favourite of people visiting South Georgia and its twittering notes have been found to be a charming music by the side of the hoarse screams of different kinds of sea birds.

VON DEN STEINEN (12) has reported about its habits, and the German expedition 1882—83 succeeded in obtaining an egg and young. The egg was described by PAGENSTECHE (1) in the following words: »trüb graugrün, dicht bedeckt mit schmutzig rothbraunen Strichen und Flecken, 22 mm. long, 17 mm. breit.» The nest was found hid in tussock-grass and constructed of similar material. This was, however, probably an exception because SÖRLING observed several nesting places, and they were all of them situated in crevices of the rocks, in fact so deep and in so narrow crevices that the nests were out of reach.

In his field-notes SÖRLING has written about this: »In the spring, in the middle of Nov. the Pipit breeds on rocky hillocks which have a growth of tussock-grass. It builds its nest in crevices in the rocks in the most inaccessible places. I have not seen any eggs or young of the Pipit, but it must breed there, because I have seen several times how Pipits with the bill filled with food came flying from the sea-shore and entered each time a certain hole in the rocky wall between the tussock-tufts. Every time I climbed up to try to find the eggs I have found the crevices so narrow, that I could not get but a couple of fingers through the opening, and the nest was situated up to 60—70 cm. inside this hole. I suppose that the

Pipit chooses such localities to have its egg and young protected against the Great Skua and other foes. Later in the summer and towards the autumn I have in vain looked for young of the Pipit. I conclude from this that the young do not leave their well protected nest before they are so fully fledged that they can shift for themselves, find their food without help, and fly well enough to avoid the danger of being swallowed alive by the Great Skua.»

»In the spring when the pairing season begins the male Pipit sits on top of some rocky hill and sings. He may then be heard from the dawn of the day, 4 o'clock till late in the evening. He sings, however, most eagerly morning and evening. The twittering notes of the Pipit are somewhat monotonous but they appear, nevertheless, beautiful and lovely in the harsh, antarctic surroundings.»

»The Pipit lives much at the sea-shore where it principally finds its food. When it is low tide it runs round among seaweed and kelp seeking food. It is a nice little bird and when it flies from stone to stone at the shore it utters some twittering notes, somewhat resembling those of the Common Wagtail when it pursues its flight in vertical curves.»

»The Pipit of South Georgia is not at all afraid of human visitors. On the contrary it could almost be termed »sociable«. If somebody walks along the shore the Pipits come flying from everywhere and alight on the ground near the walker whom they afterwards accompany, often a long way, partly running on the ground partly flying. Or, if somebody rows in a boat some little way off the shore the Pipits come flying and circle round the head of the man, as if they were looking for a suitable place where to alight, and, in fact, it sometimes happened that they sat down in the stern, or the stem.»

»Near the nest, again, they use quite different tactics. Their cautiousness and shyness there is quite astonishing. For instance, when I hung outside the crevice in the rock in which a nest was situated, and tried by means of spikes and iron-bars to break in to the nest, the parental birds remained sitting quietly some good way off. They appeared perfectly unconcerned and did not mind the work at all. No plaintive notes, no flapping over my head betrayed that they had their treasure, eggs or young, in that hole. Finally I went off without result and watched the place some way off to see if the birds would soon visit the nest. I had to wait almost an hour before the birds came, and then, from another direction, they flew directly into the hole.»

In the winter the Pipit is not so often seen on land as in the summer. It is then mostly found in small flocks at the shore, and probably wanders from one place to the other as it is much less seen. I have also a few times found dead Pipits after snow-storms. These may have starved to death in consequence of the snow covering the ground, because the coldness is less sharp when the snow-storm blows than on many other occasions.»

VON DEN STEINEN (12) found the Pipit also out on the sea on the kelp.

Chionis alba (GMELIN) 1788.Syn: *Vaginalis alba* GMELIN 1788.*Chionis vaginalis* TEMMINCK 1830.

- ♂ ♀ ♂ Royal Bay, the 8 of Jan. 1905 »Iris light brown.»
 ♀ Boiler Harbour, Cumberland Bay, the 30th of April 1905. »Irish black».
 2 pull. from the nest, Cumberland Bay, the 6th of Febr. 1905.
 1 pull. from the same nest, kept in captivity till the 21st of Febr. 1905.
 ♀ ♀ (skeletons) Royal Bay, the 8th of Jan. 1905.

Although *Chionis* is quite a common bird on South Georgia, none of the former expeditions has found its nest, or made any observations on its breeding habits. Mr SÖRLING did not succeed in finding any nest with eggs, but he found three nests containing, each of them, only one young. This seems to indicate that *Chionis* on South Georgia is less prolific than *Chionarchus* which on Kerguelen Island, according to HALL (13), usually has two and sometimes three eggs, but the Scottish Expedition found on the South Orkneys the eggs of *Chionis* as well, usually being three in number (21). Along the western side of Cumberland Bay where these nests were situated, these three pairs were the only breeders according to SÖRLING'S observations. The nests were situated at a distance from the high water mark of 5 to 6 m. under some large stones or boulders. These boulders had tumbled down from the mountain above and formed, lying partly on top of each other, a rather large heap. The nest was rather flat, and had been constructed of some straws of tussock-grass, some algæ and some moss. In and around the nest were found rotten fishes, limpet-shells, algæ etc. which together produced a disagreeable stench around the whole stone-heap. »The old birds», SÖRLING says, »were not at all afraid when I approached the nest but ran round my feet. I sat down at the entrance to the nest to study their behaviour and they went in and came out within half a yard from me. They did not produce any sound but appeared quite mute, till I took the young and set it down on the beach. Then they went towards him, calling him. The calling note consisted of some short sounds: »snarp, snarp, snarp» or »arp, arp, arp», which were repeated only thrice each time. The old birds were not more afraid than that I could catch them with my bare hands. In this way I caught two pairs of *Chionis* and put them in cages. I also confined their young together with one pair, the other pair without young, as the latter had been preserved. They seemed to do well at once, and fed the young with fish, meat and bread. One morning I found that the two parental birds had managed to escape but left the young. They returned a few times the same day to feed the young but then they stayed away for ever. When the young had lost its parents it fed itself without help. The young was after a while moved to the other pair, and they then began to feed it as if it had been their own young. After some days I found that the old birds had been let out. The young lived alone for a week, but then it died. Perhaps the food was not suitable.»

»The four parental birds which had escaped from the young, kept on board the anchored vessel, were seen on the beach near the hen-coop.¹ They went round among the fowls, picked of their food and caught fishes as well at the sea shore. They passed the nights in piles of boards near the hen-house. In daytime I used to feed them with fish, and they took the food from my hand as readily as the hens, being just as tame as they. On the roof of the hen-house I had a small box containing fish for the *Chionis* and they went there, too, to feed. At daytime they sometimes made long excursions over the fjord but always returned to the hen-house in the evening. Now and then they also paid a visit on the anchored vessel in Boiler Harbour, and were fed there, too. They remained at the establishment till the middle of April but then they disappeared completely, only paying a short visit now and then.»

When the young ran on even ground it appeared to SÖRLING that it resembled a young partridge or quail (Pl. XII fig. 49). The old birds remind one, he says, in their movements sometimes of a gallinaceous bird, sometimes of a pigeon (conf. Pl. III fig. 8, 9 & 11), but when they sit quiet, they carry the body more erect. Their favourite attitude is to sit on one leg, and they may sometimes retain that position for hours.

The downy young of *Chionis* is represented on Pl. I. It is a very pretty little bird. The ground-colour is bluish ash, lighter and more bluish above, darker and more grey below. The back is mottled with longer tufts of yellowish brown down. On the sides the longer down is partly buff, partly blackish brown. Below the lighter and longer down is still paler, buffish white. The head is finely mottled with sandy buff on blackish brown. There is a wide bare space from the gape and below the eye. The lower eyelid is whitish. In the scapular region the first white feathers appear. In the next stage the greater coverts and the tips of the quills begin to show their white colour. Then white feathers on the flanks and the tips of the tail-feathers appear. In the oldest of the young birds of this material the white feathers of the back and, in a lesser degree, those of the belly and legs begin to be developed, but none on head or neck.

In its natural condition *Chionis alba* feeds on South Georgia, according to SÖRLING, on fishes, molluscs, and algæ, »especially a kind of small green algæ growing on the stones laid dry at low tide» (*Ulvacæ?*). »In the crop of the specimens caught in Royal Bay I found only green vegetable matter, viz. of those algæ just mentioned.» K. A. ANDERSSON (8) found also that algæ consist a part of its diet. It feasted also on the carcasses of seals and whales, and collected by and by in great numbers round them. During the summer only such birds that bred in Cumberland Bay were present, but when they had left in April, it lasted only a few weeks till *Chionis* birds began to appear again, and it was then that they became so numerous, and remained so the whole winter.

SÖRLING never saw any *Chionis* steal eggs from penguins or other birds. His observations agree therein with those of VON DEN STEINEN (12).

¹ Captain LARSEN had brought with him some fowl.

From this differ the observations of the Scottish Expedition (21) on the South Orkneys. There *Chionis* was found to be quite a parasite at the penguin rookeries looking out for »dead birds or broken eggs». It was an expert egg-thief and was seen to steal »an egg from under a sitting Shag which was somewhat disconcerted» because it was photographed. The experience of the Swedish Antarctic Expedition had been just the same. K. A. ANDERSSON (8) terms *Chionis* a parasite of the penguin-rookeries and says expressively: »Er stiehlt mit Vorliebe Eier — durchsucht die Excremente der Pinguine und nimmt im übrigen gern mit jederlei Abfall von den Mahlzeiten der Pinguine und anderer Vögel vorlieb, er ist ein wirklicher Allesfresser.» It is thus very strange that the habits can be so different at different places, because if the *Chionis* of South Georgia had wanted to steal eggs, it could have had the opportunity of doing so at the *papua* rookeries.

The *Chionis* birds are very inquisitive and like to investigate shining things, like tin-cans and such like. They were also often seen and heard drumming on the shiny parts of the engine of the motor-boat.

One of the specimens has on either side at the lower margin of the naked area below the eye a cylindrical »horn» which measures about 1 cm. in length and about 1—1½ mm. in thickness. It is curved backwards and may be regarded as a teratological product effected by the continued growth of one of the papillæ. It is, however, of a certain interest, as it is present symmetrically on both sides.

Catharacta antarctica (LESSON) 1831.

Syn.: *Larus catarrhactes* CARMICHAEL 1818.
(nec. LINNÉ 1766.)

Lestrís antarctica LESSON 1831.

Stercorarius antarcticus GRAY 1844.

Megalestris antarctica GOULD 1859.

2 ♂♂ Boiler Harbour, Cumberland Bay, the 2d of May 1905. »Iris brown» in one, »iris black» in the other.

♂ pull. (halfgrown) Moraine Fjord, Cumberland Bay, the 17th of Febr. 1905.

2 pull. from the nest, Boiler Harbour, Cumberland Bay, the 12th of Jan. 1905.

1 pull. from the nest, at the foot of Mount Duse, Boiler Harbour, Cumberland Bay, the 14th of Dec. 1904.

♀, ♂ (skeletons) Boiler Harbour, Cumberland Bay, the 13th of Febr. 1905.

2 eggs the same locality, the 24th of Nov. 1904.

2 eggs, Moraine Fjord, Cumberland Bay the 27th of Nov. 1904.

The old birds in this collection have rather short bills, so that the length of the culmen measures resp. 59, 57 56 and 52 mm. The length of the bills is thus not much greater than in the bird which I have provisionally given the subspecific name *falklandica*, but the bill of the Great Skua of South Georgia is a very much stouter and heavier organ, its height being resp. 24, 24, 22 and 21 mm. in these four specimens against 17 in *falklandica*, and the width measured in a level with the

anterior border of the feathered tract on the culmen is 23,5, 22,5, 23 and 22 mm. in the former against 16 mm. in the latter.

The length of wing is 387—400 mm. and the length of the tail about 165—170 mm. In both cases it is difficult to give exact measurements in consequence of the greatly worn state of the feathers. The same condition also makes it rather difficult to describe the colour of the plumage, as it might have been different when freshly moulted. The general colour is dark brown, but the feathers of the mantle have whitish shaft-streaks and are partly edged by the same colour. All feathers of the neck, behind as well as in front, are also provided with light shaft-streaks. On the lower part of the neck these streaks are whitish but towards the nape they get a tinge in yellowish, a kind of very much bleached straw-colour, but quite different from the golden yellow of *C. maccormicki* and *C. falklandica* in the corresponding parts. The under wing-coverts are very dark blackish brown. The brown of the under parts has a tinge of grey, which is quite pronounced on the inner parts of the feathers. The young bird in its beginning first plumage is everywhere darker than the adult bird, being uniformly dark sooty brown, almost black. The remaining down is grey with a tinge of rusty at the tips.

With regard to the measurements the Great Skua of South Georgia appears to be intermediate between the true *C. antarctica* and *C. maccormicki*. Especially, the short but stout bill resembles that of the latter. With regard to the plumage the Great Skua of South Georgia does not agree with any of the two others and it seems probable that a separate subspecific race inhabits this island, although more material is needed to settle this question definitely.

The halfgrown young collected the 17th of Febr. has the feathers of the back uniformly slaty black and those of the under parts which are visible through the down, lighter, brownish grey on the belly, more slaty brown on the flanks and breast. The down is brownish grey becoming more yellowish grey on the head.

The downy young are light brownish grey.

One set of eggs is light olive grey with rather light brown blotches scattered over the surface, but somewhat more numerous at the small end. The underlying blotches pale grey with a shade of purple. The dimensions of these eggs are resp. 72×55 and 73×55 mm. The eggs of the other set is rather dark olive brown with darker brown spots more numerous at the large end. Underlying markings greyish. The dimensions are 78×53 and $78,5 \times 53$ mm.

At the end of Nov. and beginning of Dec. 1904 SÖRLING found the Great Skua quite numerous and breeding on the plains round Cumberland Bay. The first eggs were found by VON DEN STEINEN the 20th of Nov. and by SÖRLING the 24th of Nov. On the South Orkneys the eggs were not laid before the 2nd of Dec. (21). The nest is situated on the ground but the birds prefer to build on top of a tussock-hill or on grass-covered, raised beaches (Pl. XII fig. 52). The nest is according to SÖRLING's observations made of tussock-grass and rather large and deep. He found usually 2 eggs, sometimes 3, but more seldom only 1 egg. VON DEN STEINEN (12) found also the nests provided with a bedding of tussock-grass.

On the Nelson Island K. A. ANDERSSON (8) found the nests of the Great Skua on the low land where the ground was covered by brown moss. The nest was there only a shallow hollow in the moss and lined with small pieces of the same material. The colour of the eggs and young agreed very well with the surroundings in this locality so that the nests were difficult to see. Similar observations were also made by the Scottish Expedition (21) concerning the young *Catharacta* on the South Orkneys. The nests were in this latter place usually situated on moss-covered rocks or on plateaus, some times on moraines. On the South Orkneys the eggs were two in number.

K. A. ANDERSSON found on the Nelson Island never more than one egg or one young in each nest. The habits seem thus to be different in different places.¹

All visitors in Antarctic regions agree that the Great Skua is a great pest to most other birds. SÖRLING's experience is similar and he points out its greediness and impudence. It often selects a nesting-place near the rookeries of the penguins to make its stealing of eggs convenient. Round the nests of such Skuas as breed near the rookeries of penguins broken egg shells of penguins are very numerous. But all kinds of eggs are very welcome to that greedy² bird, when the young of the penguins are getting about halfgrown, SÖRLING says, the Great Skua is eagerly looking for the burrows in which *Prion* and *Pelecanoides* breed, and even makes attempts to dig out the eggs or young of these birds, lying at the opening of the burrow and scratching with its strong crooked claws. Its unsurpassed voraciousness compels it even to swallow its own eggs or young. HALL relates an example of this stating that »a pair promptly did eat one of their own young ones which had been killed» — — —. SÖRLING observed similar things several times. »On the »Leopard-point», he writes,» below Mount Duse I found a nest of *Catharacta* with two eggs. One of these was so near hatching that the young had got its head through the shell. I then broke the shell completely and laid back the young unmolested in the nest. As soon as the good old mother-bird returned and saw the young lying in the nest it instantly — swallowed it! At another opportunity I found a nest of *Catharacta* with 3 eggs down at the Moraine Fjord. I picked up the eggs to look at them and put two of them back in the nest again, but the third I placed about 2 decim. from the nest. As soon as the old bird had returned and saw the egg outside the nest she, instead of bringing it back to the nest, — ate it up and then quietly sat down on the remaining two eggs.»

The Great Skua is always on the look out to get something to eat (Pl. XII fig. 50). It watches the beach if something eatable may be thrown up by the waves.

¹ A very striking illustration to this is obtained if the statements in the following are compared with that of Capt. HURTON in his book on the »Animals of New Zealand» (1904) where he says on p. 222 »the Southern Skua, although it is called Sea Hawk by sailors, shows no disposition to attack other birds. — — — It has been given the name of Sea Hawk on account of its powerful beak and claws, and not on account of a ferocious disposition.»

² As an instance of their fearless greediness may be mentioned that SÖRLING once took an egg of a penguin and held it out to a Great Skua and it walked up quite boldly and tried to crack the egg.

It is ready at every opportunity to try to procure a meal. If somebody begins to dig up the burrows of *Prion* or *Pelecanoides* the Great Skua puts instantly in appearance to divide the spoils. If a bird is shot or disabled and not immediately secured, the Great Skua snatches it away. The same is the case if a young bird looses the maternal defense. Mr. SÖRLING shot for instance a duck on one of the small lakes and intended also to secure its only young, but before he could get hold of it a Skua had caught it and swallowed it.

The carcasses of seals and whales gave of course plentiful food to the Great Skua and it fed on them together with *Daption*, *Larus dominicanus* and *Chionis*. SÖRLING did not observe that these species of birds, nor their young were ever molested by the Skua.

The Skuas and *Chionis* visited mostly such remains of whales that lay on dry ground, while the others preferred to get their food from carcasses, or remains of such in the water. In swallowing large pieces the Skuas give perfectly wonderful performances, SÖRLING says.

On the behaviour of the Great Skuas on the South Orkneys W. EAGLE CLARKE writes (21) »These birds were to be seen incessantly hovering over the Penguin rookeries, and swooping down ever and anon at the sitting birds to snatch their eggs or young.»

»If one approaches a nest of the Great Skua», SÖRLING continues, »it is soon to be observed if they have eggs or young. In such a case they stand with the wings stretched straight upwards and the head bent to the ground, and scream as loudly as possible. They do not fly before one has come quite near to them, but when well on the wing, they are ready to attack. They swoop down on the intruder, only just missing to strike his head with their wings, rise again in the air and repeat the attacks till the foe has retired from the neighbourhood of the nest.» VON DEN STEINEN (12) has also related about »eine intensive Elternliebe der Raubmöwen als schönster Zug in ihrem Charakter.» Only the female Skua sits on the eggs, SÖRLING thinks. The male bird lies on the ground quite near the nest or reconnoitres in the surroundings without leaving the nest out of sight. When the female is off feeding, both sexes make company and then they make rather long excursions so that the eggs may be unprotected for hours at a time. The Great Skua is a hardy bird against snow and cold weather. Even during its breeding season violent storms with snow are not uncommon and the ground may be covered by a 15—20 cm. deep layer of snow. The Skua, nevertheless, remains sitting on her eggs.

In spite of this it migrates and is absent from South Georgia during the winter. This is, no doubt, originally caused by the difficulty to obtain sufficient supply of food at that time. According to SÖRLING's observations the Skuas began to migrate from South Georgia at the end of April. This migration must be an inveterated instinct, because, as SÖRLING observes, in the autumn 1905 there was no lack of food in Cumberland Bay and its surroundings as carcasses of whales, blubber and other refuse was quite plentiful. But on the other hand it was very much snow the year mentioned, and snowdrifts even to a depth of 3—4 m. occurred. In the begin-

ning of September the Great Skuas were returning, but not all of them. Only a few were then seen, here and there. A month later when SÖRLING left South Georgia they were not yet numerous. On the sea none were seen before at lat. 47° S., long. 46° W. then several specimens were seen every day. VON DEN STEINEN (12) observed the first Skuas at South Georgia already at the end of Aug. 1882, and says that their number increased especially after the 15 of Oct. According to the same authority, all Skuas had disappeared the following year in the later part of June, and the first returning one was seen the third of Sept. The migration is thus perfectly stated, although it appears to be somewhat irregular different years. This stands probably in connection with the weather different years, if the winter is severe or not.

Concerning the migration of the Great Skua from the South Orkneys the Scottish Expedition (21) made the observation that the last specimen of this kind had disappeared the 28th of April and »the first spring immigrants were noted on October 16th.»

Larus dominicanus LICHTENSTEIN 1823.

♂ ad. Boiler Harbour, Cumberland Bay, the 16 of March 1905. »Iris light brown».

juv. the same locality and date. »Iris brown».

♂ juv. the same locality, the 28th of Aug. 1905. »Iris straw-yellow with a peripheral black ring».

pull. the same locality, caught in a snowdrift during a gale with snow the 22 of Dec. 1905.

♂ (skeleton) Moraine Fjord, Cumberland Bay the 23d of Dec. 1904.

2 eggs (of 3) taken on top of a tussock-hill a few meters from the sea, Moraine Fjord, Cumberland Bay, the 21st of Nov. 1904.

3 eggs from the same locality, the 24th of Nov. 1904. »The nest was on top of a about meter-high stone among some tufts of grass growing there.»

The axis of the eggs was resp. 70, 70 and 75, 74, 73 mm. the diameter 51, 51 and 50, 51, 51 mm. The colour of the eggs may be termed light olive buff, one a little more brownish, with rather evenly, although irregularly scattered dark brown small spots which only in one specimen show any tendency to aggregate towards the large end. The underlying spots are ashy. These eggs are of medium size, to judge from the measurements published in Cat. of Eggs B. M. (Vol. I p. 213), and the colour may also be regarded as normal, although it is observed in the work quoted that in the eggs of this species the markings often form »a very irregular cap or zone at the large end.»

SÖRLING describes the nest as fairly large and »consisting of tussock-grass, algæ, moss and such material.» The nests on the South Orkneys are described in a similar way (21). It is situated on the terraces of high rocks or on large stones on which tussock-grass grows. On the rocks small colonies are formed as several pair nest at the same place. SÖRLING found, »as a rule, 3 eggs in each nest», he says. VON DEN STEINEN (12) had a similar experience on South Georgia, and K. A. ANDERSSON (8) on Graham land, but HALL (13) found on Kerguelen Island most nests contain only two eggs.

The latter author found the nests »in the seaweeds just above the highwater mark with one exception which lay in the grass.» Usually he found the nests »placed upon flat rocks sheltered partly by others.» VON DEN STEINEN (12) found also the nests in the tidal zone on grass-covered rocks on which the eggs lay »in einer einfachen, flach eingedrückten Halmstreu». K. A. ANDERSSON (8) found the nests of this species on Graham land situated on the low land and built of moss on the snow.

The downy young have the same dotted appearance as those of related european gulls.

HALL (13) has expressed as his opinion »that the young assume the plumage of the adult in one season.» With our knowledge about the closely related species *L. marinus*, *fuscus* etc. this does not seem probable. My material speaks also to the contrary. Two young birds, one shot by SÖRLING on South Georgia in the middle of March, and the other collected by the »Antarctic»-Expedition (9) on the Falklands in the later part of July, have rather similar plumage, while a third young bird, shot by SÖRLING on South Georgia at the end of August, has quite another appearance. The young specimen from the Falklands is streaked and mottled all over, there are no white tips to the blackish quills, the outer half of the tail-feathers are blackish, the inner half with narrow irregular bars, bill blackish. SÖRLING's young gull from March is darker more evenly dusky on the neck, and makes the impression of being an older bird than the former. The third specimen is quite different. The mantle is unspotted, slaty black, the feathers of the neck are white with dusky spots or shaft-streaks at the ends which produce a streaky appearance, breast and belly with white feathers which only are a little dusky externally thus producing an appearance as if the bird was soiled. Quills black, some of inner primaries with small white tips and all secondaries with broad white tips. The tail-feathers almost pure white with a few cloudy black spots, and the tail-coverts pure white. The bill is yellow although not so bright as in the old bird but even the red mark on the lower jaw is present. It is evident that this bird is not in its first plumage. I am inclined to think that it is a bird in its third year, and that the two other young birds described above represent resp. the first and second plumage. At least two different kinds of plumage in full grown birds were observed by SÖRLING so that it is quite certain that the young birds are different from the adult at least during two years.

Larus dominicanus is rather numerous in the fjords of South Georgia but SÖRLING never saw any bird of this kind far out on the open sea. Similar observations have also been made by others (K. A. ANDERSSON (8)). HALL (13) says: »I think they fear to venture far out in the open, for they are not very strong on the wing, and when a storm arises they invariably float on the water, keeping within the kelp, which grows a mile out from the beaches. In this way hundreds may be seen, riding out a gale. For variety of position the bird will stand for some time upon the kelp, and to do this it does not fold its wings for a while, but, like a boat under sail, it will incline forward, until a sure footing on the weed is obtained.»

My attention had been drawn by the very stout bill of *Larus dominicanus* compared with that of *L. fuscus*, for instance. As I believed that this stood in connection with some certain diet (probably molluscivorous) of the former gull, I asked SÖRLING, before he left, to make observations concerning this. And his observations verified my supposition as he found that the chief diet of these birds consists in *Patellæ*, which they picked when it was low tide.

When the whaling had begun they were regular guests at the factory where they picked all kinds of refuse, scraps of blubber etc. When they wanted to take such things that had sunk in shallow water, they could not dive directly but made first a jump in the air with half spread wings and then dived, but not deeper than that the tips of the wings were visible above the surface. Sometimes they robbed the *Daption's* which were more clever divers. On the carcasses they also had a good time, but seemed to prefer the refuse at the factory.

Sterna vittata georgiæ REICHENOW 1904.

Syn.: *Sterna virgata* PAGENSTECHER 1885.

» *vittata georgiæ* REICHENOW 1904.

- ♂ Boiler Harbour, Cumberland Bay, the 18th of Nov. 1904. »Iris dark brown almost black.»
 in moult, the same locality, the 15th of April 1905. »Iris blackish brown».
 the same locality, the 22d of April 1905.
 ? juv. Moraine Fjord, Cumberland Bay, the 21 of March 1905. »Iris dark brown almost black».
 ? juv. Boiler Harbour, Cumberland Bay, the 29 of July 1905. »Iris brown».
 ♀ (skeleton) the same locality the 15th of Sept. 1905.
 1 egg Cumberland Bay, the 29th of Jan. 1905.

As my friend Professor REICHENOW recently had established a new subspecies for the Tern of South Georgia I took the liberty of submitting some of the specimens recorded above for his examination and for comparison with the type. On this REICHENOW kindly replied that the bird in summer plumage completely agreed with the type of his *Sterna vittata georgiæ*.¹ The birds shot in November are rather dark silvery grey, almost as dark below as above. Forehead, lores, crown and nape deep black (although there are a few white feathers mixed in on forehead and lores). A broad white streak extends from gape to side of nape, contrasting as well with the black above as the grey below. Secondaries tipped with white and white on the inner web. Primaries more sooty, especially towards the tip, but more or less white on the inner half of the inner web. The primaries have white shafts, and the outer web of the longest is almost black. Upper tail-coverts white. Tail-feathers white on the inner web, rather pale silvery grey on the outer. Belly paler than breast, under tail-coverts white. Bill and feet red.

Wing. 263—265; tail 140—143; depth of fork 62; culmen 30; tarsus 17 mm.

The birds shot in April are not yet in full winter-plumage as the quills are not fully changed or fullgrown. They are paler all over, and may be termed light

¹ Ornith. Monatsber. Jahrg. XII N:o 3 März 1904.

bluish ash, as the somewhat sooty shade of the summer plumage has disappeared. Lores, forehead and anterior half of crown almost white with some black spots formed by the dark tips of some feathers. Hind-part of crown and nape black. Throat fore-neck and sides of neck white, hind-neck very pale pearl-grey. Chest pale grey, breast almost white, belly white. Bill darker than in summer especially the upper mandible.

A young bird shot in July may best be compared with the adult in winter-plumage. The differences are the following. Forehead more black-spotted. Underparts almost fully white, but there are some mottled feathers on the throat and chest. On the back some of the barred, sandy white and black, feathers remain. Scapulars and some of the wing-coverts are also barred, quills much darker than in adult and more or less edged with sandy white. Tail-feathers mottled with dark and buffish at the tips and with the outer web very dark greyish ash. Bill in dry state black. The feet appear to have been dull red.

A still younger bird shot in March has the head streaked with black and light sandy buff. On the nape the black dominates. Upper parts barred with black and light sandy buff. Wings as in the foregoing specimen. Rump and upper tail-coverts white with narrow dusky edges. Tail-feathers mottled at the tips with pale sandy buffish and black. Throat, fore-neck and breast finely mottled with pale sandy and dark. Belly almost white, under tail-coverts like upper. Bill blackish.

To judge from measurements etc. the adult terns mentioned above appear certainly to belong to the same species, but the question about the terns of South Georgia is not yet definitely settled. SÖRLING saw namely, during the breeding-season, not only dark terns like those described above but also such that appeared to him to be almost white, and further he says, that at the breeding place as well grey as white specimens were seen with white foreheads. It may be that the grey terns with white forehead were such specimens which were belated so that they had not yet got the full summerplumage, and it may be possible that the white specimens represented the young ones from the year before, but without more material this cannot be fully decided upon.

W. EAGLE CLARKE (21) has determined the Tern of the South Orkneys to be *Sterna hirundinacea* and it might be members of this species which appeared almost white to SÖRLING.

The Terns of South Georgia bred in colonies rather far from the sea. Some colonies consisted only of 4—5 pairs, but at least one contained about 30 pairs nesting at the same place. The eggs were very difficult to find, SÖRLING says, and the same is also emphasized by VON DEN STEINEN (12). There is only one egg according to both. It is laid without any soft bedding, SÖRLING says, in a nest of small stones and pebbles. The first nest was found about 6—800 m. from the shore, and only a step or two from a small rivulet, 2—3 m. from the first, the second was found. In the first found egg a large, almost fully developed young was found. The two eggs found were a little different in colour as the one was a little more greenish than the other. The former was light olive grey, a little more greenish on one

side than on the other, with irregular brown spots and ashy brown concealed spots. The axis of this somewhat elongate egg is 48,5 mm. and its transverse diameter is 30,5 m. m. The other egg is paler, greyish yellow.

The Terns behaved as usual at the breeding place, flapping with the wings and screaming over the intruder.

Even during the winter the Terns were numerous at South Georgia and flew then along the sea shore as the land was covered with snow. Of course, they feed on fish, and the recognizable remains preserved by SÖRLING consist chiefly of small young of *Notothenia macrocephala marmorata*.

Nettion georgicum GMELIN 1788.

Syn.: *Anas georgica* GMELIN 1788.

Querquedula eatoni CABANIS 1884.

(nec SHARPE.)

» *antarctica* CABANIS 1888.

- ♂ ad. Boiler Harbour, Cumberland Bay, the 18th of Nov. 1904. »Iris brown».
 ♀ ad. Moraine Fjord, Cumberland Bay, the 11th of March 1905. »Iris dark brown».
 ad. the same locality, the 31st of March 1905. »Iris dark brown».
 juv. May Fjord, the 2d of April 1905. »Iris brown».
 ad. Cumberland Bay, the 12th of July 1905. »Iris brown».
 juv. the same locality, Sept. 1905.
 pull. Moraine Fjord, Cumberland Bay, the 14 of Dec. 1904.
 ♂ ♀ (skeleton) Moraine Fjord, Cumberland Bay, the 3d of May 1905.

The Teal of South Georgia is evidently a very well defined species. The sexes are although, rather similar, not quite identical in colour, but easy to distinguish on the speculum. In the female the speculum is simply dark brown only marked out by the bordering light bars. In some specimens, however, the parts next to the exterior (or posterior) light terminal band show a velvety black portion. The tips of the secondaries which form the mentioned terminal band of the speculum are lighter than in the male and may be termed buffish white or sometimes almost creamy white. The inner band bordering the speculum and formed by the tips of the greater row of wing-coverts is a little more buffish, although as a rule less so, than in the male. In the latter the speculum is velvety black and the bordering bands are more buffish. In most shades of light this black speculum does not show any metallic lustre at all, but if the bird is held between the spectator and the light, and viewed from above and behind there is a well conspicuous green lustre which resembles in colour the well-known green shield on the breast of the Capercaillie. This green is strongest on the edges of the secondaries but extends almost over the whole speculum. In the female there is not a trace of this.

The crown of the head is rufous brown, rather broadly streaked with black. The sides of the head are lighter (almost buffish) brown and finely streaked with

black. The neck is similar but with still lighter ground colour, which in front becomes light grey, and on the throat almost greyish white with small elongate brown central spots to the feathers. The feathers of the chest are dark (blackish) brown (the hidden parts of the feathers lighter)¹ with broad, more or less rufous brown margins. The feathers of the breast and belly are dark brown with lighter margins which in the central parts over a more or less wide tract are almost or quite white, but towards the vent buffish grey. The feathers of the back are blackish brown with lighter brown margins, which on the mantle in some specimens are almost dull olive-brown but without any greenish tint, in others light brown or greyish brown. The margins of the scapulars are more rufous brown. The scapulars are longer and more pointed in the males than in the females. The tertials of the males have a central velvety black stripe which is absent in the female. The wing-coverts are uniformly more or less slaty brown. The under wing-coverts and axillaries slaty, the latter and the longer coverts with white margins at their distal parts and more or less powdered with white. The rump and upper tail-coverts are dark brown with somewhat lighter margins to the feathers, but these margins which are broader on the coverts are different in different specimens. In one of the males (killed $3\frac{1}{3}$) these margins are very little pronounced, and of a dull olive brown shade, in the other (killed $1\frac{1}{3}$) they are light greyish brown; the females have these feathers most similar to the last mentioned male although perhaps with broader margins. In one of the females the margins are somewhat more rufous brown. The tail-feathers are dark brown with more or less pronounced lighter outer margins. The middle tail-feathers are prolonged about $1\frac{1}{2}$ cm. beyond the others. The length of the wing is in the male 220—222 mm., in the female 209—211 mm. The length of the tail about 119—114 in the male, about 105 in the female. The length of the culmen in the male about 37—39 mm., in the female about 34.

The colour of the bill is in the living bird only black on the culmen and the nail, as the accompanying figure (Pl. II fig. 2 & 3), prepared from a sketch made by SÖRLING on South Georgia shows. The original was a male teal, shot by SÖRLING in the end of March. The colour of the bill of the female was somewhat, but not much, duller.

A young feathered, but not yet fledged teal (shot in April) has the same general colours as the adult. The wings are not yet developed, and the bill is very short only 27 mm. It looks therefore comparatively very high and is goose-like in appearance.

This little duck which reminds one somewhat about our common Teal, SÖRLING says, is quite common in the interior of the fjords on the northern side of South Georgia. In the summer it is found in numerous flocks in the inner valleys sometimes lying in the grass, sometimes swimming on the water of the small fresh-water lakes. During the winter when ice and snow covers the fresh-water lakes it

¹ The dark pigment of the feathers is thus concentrated to the central and outer parts of the feathers although not forming such well defined round spots as in allied species.

lives in large flocks along the shore of the fjords. Especially when it is low tide it is found at the shore feeding on small animals and algæ.

»The calling note of the male is a short whistling which is repeated several times», SÖRLING observes.

The flocks consist as well summer as winter both of males and females but the former are more numerous. In the summer they are not the least shy, but in the winter very shy and wary.

The nests are built in the tussock-grass. VON DEN STEINEN (12) found one such and says that it was well lined with whitish grey down.

The norwegian sailors found at the Moraine Fjord a ducks nest with 5 eggs the 7th of Dec. 1904. It was concealed in the tussock-grass and the eggs were described as yellowish and »round».

This discovery was made in the evening, and the following day SÖRLING hurried to the place with a sailor as guide, but it was too late. The many visitors the previous evening had trod down the grass so that the teals nest was laid open to the sharp yes of the ever greedy Great Skua, this pest of the Antarctic region. It had then, of course, appeared on the scene and eaten the eggs. From this and other experiences SÖRLING feels sure that a good many of the numerous teals that breed round Cumberland Bay are robbed¹ by the Great Skua, which also is ready if it gets an opportunity to snatch away the young ducklings, although these are very clever to conceal themselves. The young ducklings seem to be hatched as a rule about the middle of Dec. VON DEN STEINEN (12) observed the first ducklings the 18 of Dec. 1882. In »Jason» Harbour SÖRLING found a brood of 5 ducklings the 13th of Dec. 1904, but they managed to conceal themselves in the grass before he could secure any of them. The following day he ran across another brood, also consisting of 5 in, a rivulet with clear water which found its way through the high tussock-grass to the Moraine Fjord. Then he succeeded in catching one but the others managed to escape diving and running. They exhibited a wonderful agility and cleverness to hide in the grass, SÖRLING says, and VON DEN STEINEN (12) reports a similar experience. He says that he several times heard ducklings quite near, but when he tried to pursue them, he was not even able to detect them. And sometimes, when he had observed them, they disappeared under his hands. This great agility and faculty of hiding is of the outmost importance for the existence of the species when it has such a deadly foe as the Great Skua.

To judge from the fact that 5 eggs or 5 youngs were repeatedly observed this number may be regarded as the average.

¹ Some of the robbed teals, lay eggs again and try to raise a new brood which explains that von DEN STEINEN (12) found recently hatched youngs so late as in Febr.

Phalacrocorax atriceps georgianus n subsp.?

- ♂ Boiler Harbour, Cumberland Bay, the 15th of Aug. 1905. »Iris light brown».
 ♀ juv., Cumberland Bay, the 6th of Febr. 1905. »Iris light grey».
 ♀ juv. (larger than the foregoing) the same locality and date. »Iris dark grey».
 1 pull. (just hatched) taken from the nest, at the foot of Mount Duse, Boiler Harbour, Cumberland Bay, the 17th of Jan. 1905.
 1 egg from a nest at the foot of Mount Duse, Boiler Harbour, Cumberland Bay the 4th of Dec. 1904.
 3 eggs the same locality, the 14 of Dec. 1904.

The Cormorant of South Georgia was regarded by PAGENSTECHE (1) and VON DEN STEINEN (12) as *Ph. carunculatus*. K. A. ANDERSSON (8) believed it to belong *Ph. atriceps*, but his material was unfortunately lost so a definite classification could not be made. SÖRLING has in his collection only one fully adult individual in full plumage and this one certainly comes next to *Ph. atriceps*, and two coloured sketches made by him of a male bird killed in April indicate the same (Pl. II fig. 4 & 5).

There is, however, some differences which indicate that the bird of South Georgia represents a separate race, which also has been suggested by OGILVIE GRANT.¹ The most apparent of these differences is that the ear is not situated »in the middle of the white plumage», as in the typical *atriceps*, nor »in the middle of the black plumage», as in *albiventer* but the opening is just on the margin between both areas. This means that the black of the crown descends further on the sides of the head in the South Georgia Cormorant than in the typical *atriceps*. If this is constant it is an easily observed characteristic. The nasal caruncles appear to be better developed in the former than in the latter (conf. Pl. II fig. 4 & 5).

The description of the male in full plumage is as follows. Forehead, crown, sides of head to a horizontal line through the lower margin of the eye and through the ear, nape, posterior part of neck and the whole back to the tail-feathers black with a strong blue gloss which especially on the hindneck has a violet lustre. Wings and scapulars, small as well as large, black with an oily green gloss. In some lights there comes a somewhat greenish shade over the back in the mantle-region but, as a rule, in most lights the blue back is sharply defined from the green wings and scapulars. The white alar bar is well developed and extends up to the bend of the wing. There is a large white dorsal patch on either side, but it is nearly concealed by the folded wings, only a few white feathers being developed in the middle of the back. The beauty of the bird is increased by a 5—6 cm. long recurved crest, and by all, blue and green, feathers having the margins designed by a narrow band with a stronger metallic lustre. Throat, fore-neck, sides of neck and all under parts pure white. Outsides of legs black.

Tail-feathers black with basally white shafts.

Nasal caruncles yellow, skin round the eyes blue, feet light red. Culmen 57; wing 280; tail 135; tarsus 60; outermost toe and claw 105 mm.

¹ Cat. Birds, Brit. Mus. Vol. XXVI p. 392.

The largest of the young ones preserved has a total length of about 60 cm. Although it has attained such a size it is still in down, but the white feathers of the under parts begin to shine through. On the back the feathers are less developed and not at all visible with the exception of the scapulars. The quills and greater coverts are also developed to some extent. The tail is already about 12 cm., owing to its great importance for the support of the bird when it stands. The colour of the down is dark grey, somewhat lighter on breast and belly but decidedly darker on the head and neck. A very interesting characteristic is the presence on the head of some scattered white downs which although less numerous give a similar impression as the white filoplumæ of the Common cormorant in full plumage.

The other young nestling is about 48 cm. long. Its tail-feathers have not attained a greater length than 3 cm. and are the only feathers developed. Otherwise this young is fully clothed in down of the same colour as in the larger young, except that there are several tufts of whitish down on the under parts. The white and somewhat silky »filoplumæ» are much more numerous, than in the larger young, on the head of this one and extend over the nape and upper neck. On the throat there are only some few, and on the fore neck as well only a small number.

The nasal caruncles are not yet developed, as such, in either of these specimens, but nevertheless present in the shape of a kind of coarse granules reminding one of the scales of some lizards. The area below and behind the eye is naked and presents a somewhat scaly appearance with the tip of a beginning down projecting behind each scale.

The just hatched young collected the 17th of Jan. is quite naked.

The eggs of this cormorant are pale bluish green with an imperfect coat of white chalky matter. They are elongate, sometimes almost fusiform but with comparatively blunt ends. The measurements of three eggs, belonging to one and the same set, are resp. 64×39 ; 70×38 ; 66×40 mm., and of a fourth egg from another set 64×39 mm.

At the foot of Mount Duse the cormorants bred in a small colony of about 10—12 pair. The rather large nests were built of tussock-grass and situated on ledges of the rocks high above the surface of the sea. Each set of eggs consisted of 3. Exceptionally two eggs were seen in a nest by SÖRLING, but never four.

Both parents help to feed the young according to SÖRLING's observations.

On the Shag Rocks, W. of South Georgia, the Swedish Expedition 1901—1903 found a large colony of cormorants probably belonging to this same race, but no specimens were caught there (8). Whether the cormorants of the South Shetland Islands and Graham land are representatives of the typical *atriceps*, or not, cannot be decided for reasons already mentioned. The Shag of the South Orkneys is described by W. EAGLE CLARKE (21) as true *atriceps*.

The German Expedition 1882—83 observed only few cormorants on South Georgia so that they do not appear to be numerous there. In the true antarctic lands and islands (Graham land, South Shetland and neighbouring islands) visited by the Swedish Expedition the rookeries were inhabited by thousands of specimens. K. A.

ANDERSSON (8) says that they usually were situated on the northern sides of the rocks and cliffs where the snow melted more quickly, and he thinks that the nests are used year after year. They were placed about half a metre from each other and built of algæ, colonies of bryozoa etc. On the Paulet Island the young cormorants were fully fledged the last Febr. 1903, but they were not developed so early on South Georgia. This difference is due to the fact that the cormorants lay their eggs about a month earlier in the true Antarctic region than in South Georgia. K. A. ANDERSSON (8) collected the first eggs on the Paulet Island the 2d of Nov., and the same date J. G. ANDERSSON found the first eggs on the Cockburn Island; on the South Orkneys the Scottish Expedition stated that the Shags had commenced laying eggs the 8th of Nov. (21), while SÖRLING found fresh and new laid eggs in the first part of Dec. There is still another difference with regard to the propagation of this bird in the true Antarctic region and in South Georgia, as it in the latter place usually has 3 eggs in the former as a rule »only 2 eggs, sometimes, however, 3» (8). This may stand in connection with the need to raise the youngs quicker in the Antarctic and this may be done more easily, if the parents only have to provide two youngs with food.

Phoebetria fuliginosa (GMELIN) 1788 **cornicoides** HUTTON 1867.

Syn.: *Diomedea fuliginosa* GMELIN 1788.

Phoebetria » REICH. 1852.

1 ♂ Moraine Fjord, Cumberland Bay, the 30th of Jan. 1905. »Iris brown».

This specimen has the abdomen and the back so light that it can be regarded as belonging to *cornicoides* HUTTON, and the general distribution of the colours is certainly like that of a crow. This species breeds on rather narrow ledges on steep rocks rising directly from the water. The shelves, on which they nested, had a vegetation of grass so high that only the heads of the breeding birds could be seen above the grass from below. The ledges were quite unaccessible with the steep mountain rising above and the water beneath. The height above the sea was so great that it was a lucky incident that a gunshot killed the specimen recorded above. Several other shots had no result, and no eggs or youngs could be reached. About 8—9 pairs were observed, partly on the eastern side of Mount Duse, and partly on the eastern side of the Moraine Fjord. At the latter place the rocks rose above small fresh water lakes, on the former above the sea. Each pair had its own place far from others.

Their sound was a »wee» with a long-drawn and sharp »ee». This sound was emitted when somebody approached the nest. The birds remained in the nest till shot at. Only one bird at a time was seen in the nest. During the winter they were not seen in the fjords, nor were they seen attacking carcasses. Over the open sea they were rather more common than the other albatrosses.

On the way back and forth they were not observed further north than to about 42° S. lat.

In Royal Bay the German Expedition 1882—83 found the Sooty Albatross nesting. VON DEN STEINEN (12) describes the nests as »niedrige, abgestumpfte Erdkegel; die Wandung ist lehmig glatt, die flache obere Aushöhlung mit cinigen Halmen gefüttert, das Gras ringsum abgebissen.» Old nests seemed to be used over again. The height of a fine nest was measured to be about 22 cm., and its largest diameter about 40 cm. The 1st of Nov. an egg was laid. HALL (13) measured a nest of *Ph. fuliginosa* (not *cornicoides*), on Kerguelen land and it had nearly the same diameter but was only about 4 cm. high. The situation of the nests was as well in Royal Bay as on Kerguelen land under ledges of rocks.

Phoebetria cornicoides was observed by the Scottish Expedition (21) to extend its wanderings »almost to Saddle I.» of the South Orkneys.

Thalassogeron culminatus (GOULD) 1844.

Syn.: *Diomedea culminata* GOULD 1844.

Thalassogeron culminatus BAIRD 1884.

(1 skeleton of a bird caught on the way between South Georgia and Buenos Aires, the 7th of Nov. 1904.)

This bird is about as numerous as the foregoing but only on the open sea off the coast and it never puts in appearance in the fjords. It was not observed at South Georgia by the German Expedition 1882—83 nor by the Swedish Expedition 1902. By the Scottish Expedition it was seen »to within sixty miles of the South Orkneys» (21).

When returning from South Georgia SÖRLING saw at some distance from the island »a black billed albatross, black above and white beneath with white head and of about the size of a *Thalassogeron culminatus*.» It could not be caught because it was defeated by the other Albatrosses and driven from the bait. SÖRLING could not identify this bird.

Diomedea melanophrys BOIE 1828.

(1 skeleton of a bird caught off the coast of Brazil, the 23 of Oct. 1904.)

This species was collected and observed at South Georgia as well by the German Expedition 1882—83 (1) as by the Swedish Expedition 1902 (8, 9).

Only once SÖRLING saw this species soaring over Boiler Harbour otherwise it kept itself over the open sea, where it was common, but not very numerous.

HALL (13) found a large rookery of this species on Kerguelen Land.

Diomedea exulans LINNÉ 1758.

The Wandering Albatros was found breeding in Bay of Islets by the Swedish Expedition 1902 as is described by K. A. ANDERSSON (8). Its youngs were still in down in the middle of May without showing a single feather, and they remained lying in the nest, in spite of their great size. The nests were according to the author quoted (8) about $\frac{1}{3}$ m. high and had at the top surface a diameter of about 1 m.

SÖRLING never saw *Diomedea exulans* enter Cumberland Bay, but only flying over the open sea. They were especially numerous on the outer bank among the schools of whales, and were swimming there like swans, as the sailors said.

This species was not represented in the collections of the German Expedition of 1882—83 (1) nor were any observations about its appearance recorded by VON DEN STEINEN (12).

The Scottish Expedition (21) did not observe but two straggling albatrosses off the South Orkney Islands, and the species to which they belonged was not ascertained.

Pelecanoides urinatrix (GMELIN) 1788.

Syn.: *Procellaria urinatrix* GMELIN 1788.

Pelecanoides » LACÉPÈDE 1801.

Halodroma » ILLIGER 1811.

♂, ♀ Boiler Harbour, Cumberland Bay, the 4th of Dec. 1904. »Iris dark brown».

♂, ♀ (skeletons) the same locality, the 28 of Nov. 1904.

2 pull. (in alcohol) the same locality, the 20th of Febr. 1905.

1 egg the same locality, the 4th of Dec. 1905.

The specimens recorded above are typical *P. urinatrix* with fore-neck and under wing-coverts pure white. The male is on the back more shiny black with a bluish lustre. Its wing is somewhat longer viz. 119 mm., while that of the female is 116 mm.

The almost spheroidal egg measures 37 mm. in length by 31 in width. It is plain white but soiled. The eggs are always single, and appear to be laid by different birds at a somewhat different time as the two downy youngs taken the same date (the 20th) in Febr. differed considerably in size, the larger being several times bulkier than the smaller one. In the larger the quills begin to develop. In both the fluffy downs leave a bare space on the sides of the head, the throat and the sides of the upper neck. But when at rest the youngs draw back their head so that these bare spaces are not exposed, and only the bill is visible protruding out of the ball of down. The colour of the down is uniformly ashy grey.

Pelecanoides urinatrix makes burrows like *Prion*, but according to SÖRLING's observations, it chooses different localities. Unlike *Prion*, it does not select »tussock-hills» but prefers places where the ground consists of gravel and sand from moraines.

Its burrows look in section as the accompanying diagrammatic sketches show. The burrows were always crooked. And it looked sometimes as if the bird had dug searching for a suitable place under a stone. The nest is, namely as a rule, situated below a somewhat larger, flat stone. Usually there is no bedding at all, but sometimes a few (2—3) straws of tussock-grass are found. Before the egg was laid, SÖRLING found both birds in the burrow, but as soon as the egg was laid, only one bird was present, sitting on the egg, and that was, in the cases investigated, the female.

Pelecanoides urinatrix like *Prion* did not dare to show itself over or near land during day-time. On the open sea it was, however, very numerous swimming and flying. When flying it looks almost more like a member of *Alcidae* than a petrel. It is subantarctic not extending to the real ice-region. At the South Orkney Islands it was not recorded by the Scottish Expedition (21).

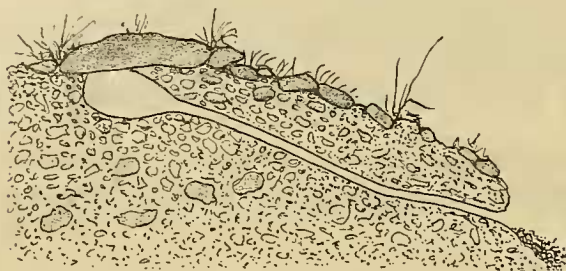


Fig. 6 a.

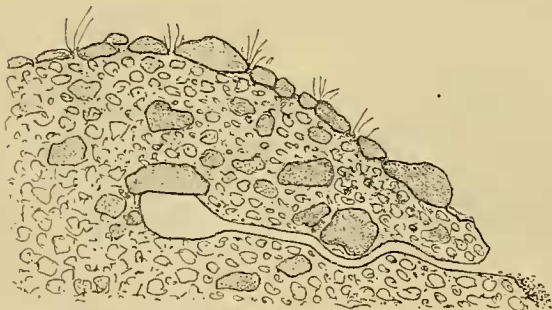


Fig. 6 b.

Diagrammatic sketches showing the burrow of *Pelecanoides urinatrix*.

Pelecanoides exsul SALVIN 1896.

1 ♀ Boiler Harbour, Cumberland Bay, the 15 of April 1905. »Iris black».

This bird flew against the rigging, fell down in the anchor-store and was caught that way. This was the only specimen which SÖRLING with certainty observed as belonging to this form. This is a little peculiar as the three specimens of *Pelecanoides* collected by the Swedish Antarctic Expedition 1902 at South Georgia in the same locality all of them were just as typical *exsul* (9) as this one with regard

to the colour of the plumage. When both forms inhabit the same locality and the only difference between them consists in that *exsul* has the feathers of the fore-neck provided with a grey subterminal bar, the feathers of the flanks with a grey shaft, and the under wing-coverts with dark shafts, while *urinatrix* is pure white on the parts mentioned, it appears to me that it is rather probable that these two kinds of birds are not specifically different but only dark and light phases of the same species, in an analogous manner, as for instance, *Fulmarus glacialis* and the Common Skua [*Stercorarius parasiticus* (LINNÉ)] have a dark and a light phase. As only *urinatrix*-specimens were found in the burrows it might be possible that *exsul* is the immature not breeding bird.

Prion banksi GOULD 1844.

- ♂ Boiler Harbour, Cumberland Bay, the 19th of Nov. 1904. »Iris very dark brown, almost black.»
 »Caught in the burrow, in the nest was 1 egg.»
 ♀ the same locality, the 22d of Nov. 1904.
 ♂ juv. the same locality, the 24th of March 1905, an almost fully fledged bird, caught in the nest.
 »Iris black.»
 1 pull. the same locality, the 20th of Febr. 1905, dug out from the nest.
 1 pull. the same locality.
 2 pull. found on the deck of the vessel in Boiler Harbour, Cumberland Bay, the 5th of Febr. 1905, evidently dropped there by a *Catharacta* which was seen flying away.
 ♂ (skleton) Moraine Fjord, Cumberland Bay, the 22d of Nov. 1904; caught in the burrow.
 ♀ (skleton) Boiler Harbour, Cumberland Bay, the 4th of Dec. 1904; caught in the burrow.
 ♂ (skull) the same locality and date.
 1 egg, Boiler Harbour, Cumberland Bay, the 19th of Nov. 1904.
 1 egg, the same locality, the 13th of Dec. 1904.
 1 egg, » » » » 17th of Dec. 1904.
 1 egg (rotten) the same locality, the 14 of March 1905.

The specimens recorded above must be referred to *Prion banksi* as the width of the bill is 14—15 mm. in adult specimens, and the lamellæ of the maxilla are just visible at the rictus, when the bill is closed. The bill of the just fledged young is almost as wide, viz. 12,5 mm. The length of wing is 191 mm. in a male, 188 mm. in a female, and 186 mm. in the fledged young. The latter has the down partly remaining on the belly, and on a patch on either side of the lower back, in which places the fluffy downs sit on the tips of the feathers in such a manner that each ramus of the feather is continued into a soft »plumule»-like part.

A young with the length of the wing amounting to 170 mm. has almost the whole body surrounded by down on top of the feathers.

The colour of the young in its first plumage is almost identical with that of the adult bird, although the latter may be a little darker. The down is grey above and whitish beneath.

The down of not yet hatched young is dark, almost black as well above as beneath.

The size of the eggs is somewhat variable. The following measurements prove this: axis 49,5 mm.; diameter 34,3 mm.

» 51	»	»	34	»
» 45	»	»	33,5	»

They are plain white, without gloss when washed, but in the nest they are much soiled. The surface is fairly smooth.

Mr. SÖRLING has made the following interesting observations on this bird and its nesting habits:

»On the open sea *Prion* is seen in enormous quantities. Here they fly round above the schools of whales and procure their food. The nest is situated rather deep into the ground under tussock-hills and similar formations. It consists only of a hollow at the end of the burrow without any bedding. The burrow resembles that

of a common vole. Outside the entrance lies the earth that has been scratched out. From the entrance the burrow is conducted more or less crookedly into the interior of the tussock-hill which consists of a peaty soil. The length of the burrow varies from $\frac{1}{4}$ to 1 m., depending upon the size of the tussock-hill. The nest lies 20 to 30 cm. below the surface.» The diagrammatic sketch reproduced here, is made by SÖRLING on South Georgia, and shows approximately the arrangement of a burrow and nest of *Prion banksi* in a tussock-hill. »*Prion* is never seen at day time near the nest», SÖRLING continues in his notes; »it never visits its nest by day-light, for then it remains in the burrow, or has left it for the open sea already before day-break. In the middle of November it had new laid eggs, at the end of March fullgrown youngs. Only one egg was found in each nest. The development from egg to fullgrown young bird took thus four months. When *Prion* has eggs, as well male as

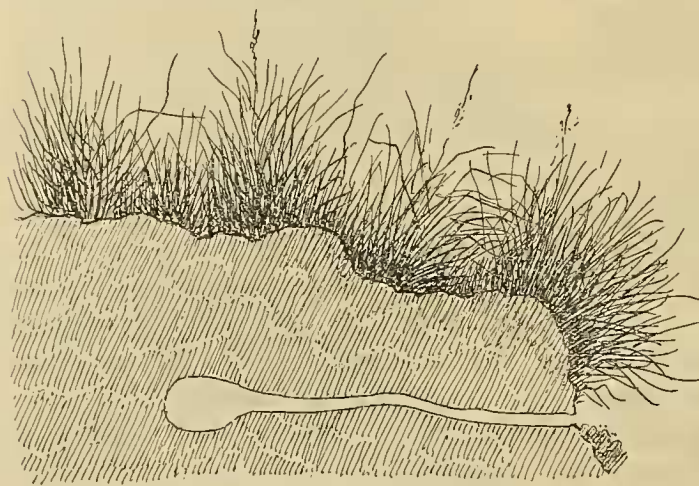


Fig. 7. Diagrammatic sketch of the burrow of *Prion banksi*.

female sit in the nest at the same time. But as soon as the downy youngs are hatched, only one parent-bird, or just as often none, is found in the nest during the day. The worst enemy of *Prion* is the Great Skua. I have several times observed, how the Great Skua tried to dig out the nests of *Prion*.»

It is evident that it is fear of this terrible foe which compels *Prion* to stay out on the open sea, or remain in the burrow during the day. »As soon as they show themselves in the fjords the Great Skua instantly swoops down on them and hunts them. When I for instance dug up some burrows to get eggs or youngs of *Prion*», SÖRLING says, »and the old birds were disturbed and forced to fly away *Catharacta* sat in wait for them, and as soon as they appeared, they were pursued, attacked and swallowed, as it appeared, in one gulp at once.» »As soon as one begins digging,» SÖRLING says, »*Catharacta* comes expecting to get something, and the poor *Prion* is, as a rule, always overtaken, and tries in vain to escape its enemy by flying hither and thither. When overtaken, they disappeared so quickly that they seemed to be swallowed without any previous killing act.

PAGENSTECHER (1) refers the specimens of *Prion* found on South Georgia by the German Expedition 1882—83 to »*Prion turtur*».¹ A specimen procured in Cumberland Bay in April 1902 by the Swedish Expedition I have myself (9) referred to the same species (if it is a species), and maintain this opinion, since I have been able to compare this specimen with those of *P. banksi*, recorded above. The bill of

¹ *Prion turtur* (BANKS) 1820 regarded as synonymous with *P. desolatus* (GMELIN) 1788.

the specimen referred to, is not wider than that of the young of *P. banksi*, taken in the nest, and the lamellæ of both has attained about the same degree of development. The question then lies near at hand: is *Prion desolatus* only the immature *P. banksi*? But I suppose it cannot be so, as breeding birds have been determined as *P. desolatus*. The specimen I regard as *P. desolatus* makes the impression of being an adult bird. The length of the wing is 194 mm., thus a little more than that of the male specimen of *P. banksi*, measured as above. The nail of the bill and the claws are lighter than in my specimens of *P. banksi*. This might, however, be an individual difference and the question about the identity, or not, must remain open.

The *Prion* breeding on Kerguelen in very great numbers is regarded by HALL (13) to be *P. desolatus*. Its habits are described to be similar to those of the South Georgia bird. HALL found once »three birds to one egg in one hollow.»

Prion banksi is subantartic and does not enter the real ice-region. During the winter it was not seen on land but already at the end of Sept. some sailors told SÖRLING that they had caught a few *Prion* in their burrows.

The Scottish Expedition (21) observed *Prion banksi* off the South Orkney Islands, but within the territorial waters only once.

Daption capensis (LINNÉ) 1758.

Syn.: *Procellaria capensis* LINNÉ 1758.

Daption » STEPHENS 1826.

♂, ♀ Boiler Harbour, Cumberland Bay, the 10th of May 1905. »♂ Iris black (brown)». »♀ Iris brown.»

(♀ (skeleton) caught off the coast of Brazil ²⁰/₁₀ 1904.)

Wing: ♂ 256 mm., ♀ 258 mm.

PAGENSTECHEER's observation that the male should be »erheblich stärker» does not hold good. But both specimens are smaller than the average measurement of the wing recorded by SALVIN in Cat. Birds B. M. (Vol. XXV p. 429) viz. 10,5 i. (= 266,5 mm.)

To begin with, no specimens of *Daption* were seen in the inner part of Cumberland Bay, but after a month they began to collect, allured by the dead whales, which they attacked swimming round them, seldom sitting on the carcasses themselves as *Ossifraga* did. They did not sit with straight tarsi as gulls, but always like *Fulmarus* with the whole tarsus resting on the ground, whether it was on ice or anything else. On a high snowdrift near the water the *Daptions* were often seen sitting and resting, but that was on a selected spot and seldom they alighted on other places. They rested, however, more often on the water with the bill under the wing-coverts. In the summer they were heard crying and chattering day and night, feeding and fighting each other. As soon as they were satisfied they swam away and began to clean and preen themselves and to bath. With half-opened wings they easily dived down after such refuse from the establishment that had sunk in

shallow water 1—1½ m. They did not swallow what they had picked up before they had come up to the surface again. They remained near the establishment the whole winter and could be counted in thousands there, in consequence of the ample supply of food.

The most northern locality on which *Daption* was observed, on the way back and forth, was at the latitude of Rio Grande do Sul.

Mr. SÖRLING did not observe any breeding specimens on South Georgia nor any »that looked like young birds.» To judge from VON DEN STEINEN's (12) observations it is, however, probable that the Cape Pigeon really does breed there, although perhaps in less number than on Kerguelen Island. The Scottish Expedition was lucky enough to find it breeding in rather great number on the South Orkney Islands, and for the first time secured the eggs of this well known bird. W. EAGLE CLARKE (21) has also described its breeding habits from the experiences of the expedition just mentioned, and he emphasizes that the nests were found on open ledges of cliffs, in contrary to the observations made on Kerguelen Island where nests of the Cape Pigeon »were obtained in burrows and grottoes.» HALL (13) found the nests on Kerguelen Island »in the cavities of a rough cliff», and says that »these cavities or grottoes» were »approximately 6 × 3 × 3 feet.» But the »Gazelle» Expedition (15) found an egg of this species »einfach in eine Spalte zwischen Klippen gelegt», and it is remarked in consequence of this that this bird does not seem to breed in hollows. The habit with respect to the selecting of nesting places is thus variable even on Kerguelen Island.

*Ossifraga*¹ *gigantea* (GMELIN) 1788.

Syn.: *Procellaria gigantea* GMELIN 1788.

Fulmarus giganteus STEPHENS 1826.

Procellaria ossifraga FORST. 1844.

Ossifraga gigantea JAQ. PUCH 1853.

1 egg collected at the eastern side of the Moraine Fjord, Cumberland Bay the 21st of Nov. 1904.

2 eggs the same locality, the 24th of Nov. 1904.

Two eggs from dark birds measured resp. 104 and 104,5 mm. in length and 64 and 64,5 mm. in width. An egg from a white bird was a little shorter and thicker resp. 101,5 mm. × 67 mm.

The nest lay quite open and unprotected. It was built of straws of grass and rather flat but always situated on the top of some small convexity of the ground.

The Giant Petrels were very greedy on the carcasses of whales, but nevertheless rather shy so that they, as a rule, did not allow anybody to come within gunshot, at least not in the harbour.

¹ RICHMOND: has recently proposed the new name *Macronectes* for this genus as *Ossifraga* HOMBR & JAQ. 1844 should be preoccupied by Wood 1835. I have not been able to form any independent opinion in this question as yet.

The birds always alighted in the water near the carcasses and then swam forward to them and climbed up on them. *Ossifraga* can walk on straight legs, and as soon as it is in a hurry, it spreads the wings. When resting, the whole tarsi touch the ground.

SÖRLING did not observe *Ossifraga* attacking the penguins or other birds so it must have been rather »civilised» there, or had abundant food without molesting others.

»Grey» birds were most numerous, then the »black», and the »white» rather rare. As a rule they kept themselves on the open sea and did not enter the fjords, except in Cumberland Bay where the dead whales attracted them.

The Giant Petrel of South Georgia appears to have learned that man is a very dangerous being. Formerly it was not so. VON DEN STEINEN (12) reports that when the German Expedition 1882—83 first arrived the Giant petrels were quite tame, but in a few weeks they became so shy that they took to the wings as soon as they perceived »the head of a man above the top of a hill.»

VON DEN STEINEN (12) saw the Giant Petrels begin to build their nests already in September, and the 2d Nov. he found the first eggs. The same author describes also the courting habits of these birds, and also how they defend their eggs. In the middle of May the young birds have lost the last down. The 3d of May 1902 K. A. ANDERSSON (8) found that the majority of the young had assumed the first (blackish) plumage, but some were still in down.

On the South Orkney Islands the Giant Petrel builds a nest of small stones about 2 feet in diameter (21), and according to the observations of the Scottish Expedition, the first eggs were laid the 4th of Nov., thus almost at the same time as on South Georgia. On the South Orkney Islands the Giant Petrel is »a terrible scourge» (21) to the Penguins, preying on their eggs and young, and the same is reported by other expeditions to the Antarctic as well.

In South Georgia the Giant Petrel remains winter and summer but further south it is only a summer visitor. The Swedish Expedition 1901—1903 found it breeding only on the Nelson Island and at the Gerlache Channel in the Graham Land region. BRUCE has reported it breeding on the South Orkney Islands and the Scottish Expedition estimated the number on Laurie Island alone to about 5,000 in the breeding season (21). On Marion and Kerguelen (13) Islands it breeds as well. But to South Victoria Land (14) and Kaiser Wilhelm II Land (16) it comes only as a visitor and is not known to breed there. Although it is circumpolar, it is rather a subantarctic than a truly antarctic bird, even if it extends its wanderings in summer and autumn very far south. A considerable number breeds as well in the true Antarctic as is already mentioned but, on the other hand, its breeding region reaches comparatively too far north for an antarctic bird as it embraces as well the Falklands as New Zealand.

Pagodroma nivea (GMELIN) 1788.Syn.: *Procellaria nivea* GMELIN 1788.*Daption niveum* STEPHENS 1826.*Pagodroma nivea* b. *minor* BONAPARTE 1855.

- ♂ Antarctic Bay, the 28th of June 1905. »Iris light brown».
 ♂, ♀ Cumberland Bay, the 12th of July 1905. »Iris brown».
 ♂ Boiler Harbour, Cumberland Bay, the 28th of July 1905. »Iris brown».
 (skeleton) Boiler Harbour, Cumberland Bay the 25th of July 1905.
 + (skeleton) the same locality the 3d of Aug. 1905.

The length of wing in the two ♂♂ is resp. 262 and 267 mm. and the same measurement in the two ♀♀ resp. 248 and 249 mm.

The length of the tail is in the former about 128 and 124, and in the latter 109 and 106 mm.

The specimens are accordingly of small (♀♀), or medium size (♂♂) and there is a quite conspicuous difference in size between the sexes in this case, but this is only a coincidence as Dr. SHARPE has found among the birds of the »Southern Cross» Expedition (6) females of the same size as the largest males.

PAGENSTECHEK (1) found in the specimens of *Pagodroma*, which he examined, the black hair-like feathers at the eye better developed in the female than in the male specimens. This does not hold good in the four specimens before me but rather the contrary.

In one of the females the feathers are not all of them quite snowy white. The wings have a light shade of pearly grey which darkens somewhat towards the tips of the quills, so that the tips of the first primaries are looking rather dusky. This is effected by the *rami* of the web becoming more and more completely black. The feathers of the back, the upper tail-coverts and especially the lesser wing-coverts show very light, but nevertheless fully conspicuous, ash-coloured subterminal bands, which give a delicate undulated appearance to the parts mentioned. It is possible that this is an immature bird, but in any case, it is a very interesting skin, as it gives a hint about the colour-pattern of the ancestors of *Pagodroma*.

The black pigment on the *rami* of the primaries is present in all four specimens although less conspicuous in three than in the fourth. It appears, just as PAGENSTECHEK (1) has described, in the shape of »mikroskopisch feine, schwarze Längsstrichelchen und Pünktchen.» If these marks should not be present in specimens of *Pagodroma* from other localities there might be some reason to distinguish the bird from South Georgia with the subspecific name »*novegeorgica*» as is proposed by PAGENSTECHEK.

The German expedition 1882—83 found *Pagodroma* breeding in crevices of rocks on the mountains near the sea. The birds were so tame that they could be caught with the hand. W. EAGLE CLARKE (21) has described its nesting habits on the South Orkney Islands. There the eggs are laid at the end of Nov.

Mr SÖRLING found *Pagodroma* rather numerous out on the sea, and it visited the Bay now and then, especially when the drifting ice set in. It did not attack the carcasses of whales at the establishment, but picked smaller pieces of blubber, and other floating refuse. In the Bay it only appeared during the winter from the first part of July.

When sitting on the drifting ice it always rested on the tarsi and could not sit, or walk on straight legs.

Pagodroma is circumpolar. K. A. ANDERSSON (8) found it breeding on the Uruguay-, Coekburn- and Loekyer-Islands etc., the Scottish Expedition (21) on the South Orkney Islands, the »Southern Cross» Expedition (6) on Cape Adare, South Victoria Land, and VANHÖFFEN (16) on Mount Gauss (Kaiser Wilhelm II Land).

Majaqueus æquinoctialis (LINNÉ) 1758.

Syn.: *Procellaria æquinoctialis* LINNÉ 1758.

Puffinus » STEPHENS 1826.

Majaqueus » BONAPARTE 1856.

♀ (skeleton) caught in the nest, about 1 m. long burrow under some grass tufts, at the foot of Mount Duse, Boiler Harbour, Cumberland Bay 17th of Nov. 1904.

2 eggs the same locality, the 4th of Dec. 1904.

1 egg » » » » » » » » » »

Length 82	×	Breadth 50	mm.)	} These eggs were found in the same nest.
» 82,5	×	» 55	»	
» 82	×	» 56	» single egg.	

The eggs are white but stained brownish as they lay on the bare ground without any bedding. The eggs were found at the end of a burrow which extended about 1 m. or more into the ground. Some burrows were so long that it was found too difficult to dig them out. The earth was frozen as well round as below the nest, which only consisted of a small hollow, in which the warmth of the sitting birds had somewhat thawed up the earth and melted the frost to water so that the eggs lay partly in water in a mud-puddle. Both birds were found in the nest and were very soiled by the thawed up dirt.

Like HALL (13) and others, SÖRLING made the experience that *Majaqueus* can bite severely but also use its very sharp-pointed claws with great dexterity. As a rule only one egg was found in each of 6 opened nests with the single exception quoted above.

The German expedition 1882—83 found also *Majaqueus* breeding on South Georgia. The first birds appeared, according to observations 1882, in the middle of Oct. (12), and at the end of Nov. (1) or beginning of Dec. (12) the first eggs were found. In the beginning of May the young were able to fly.

On his way south in the middle of November SÖRLING saw single specimens of *Majaqueus* north of South Georgia almost every day. The 18th of Nov. birds

were heard in their burrows emitting a shrill, quavering whistling. This was not heard, however, at a distance, but just when one approached within about 10 m. The whistling was repeated with short intervals, even when the digging had begun. The burrows were situated on a small plateau about 10—12 m. above the surface of the sea. The access to this plateau was sloping gently on one side, quite steep towards the sea on two sides, and on the fourth the mountain rose. The plateau was covered by tussock. And the openings to the burrows were found at the ground, at the base of the tussock hills. Usually the burrows were horizontal. In the opening they were wider without sharply defined limits, but soon they became rather narrow, hardly more than about 10 cm. in diameter. At the inner end the burrow expanded to the nest, the horizontal diameter of which was about 45 cm.

The birds were during the breeding season never seen flying about in the day time near their nests nor feeding in the bay.

HALL (13) made the observation on Kerguelen Island that *Majaqueus* made its burrow in places where the ground was thoroughly saturated with water and that the opening often was placed under a small cascade. The floor of the nest-cavity was covered by water and in the middle was »a raised circular bed of rootlets, saucer-like, inverted, with an indent just above the water-level.» HALL (13) found only one egg in each nest.

VON DEN STEINEN (12) speaks also about a nest of grass in the sodden burrow of *Majaqueus*.

W. EAGLE CLARKE (21) states that *Majaqueus* does not breed on the South Orkney Islands.

Thalassoeca antarctica (GMELIN) 1788.

Syn.: *Procellaria antarctica* GMELIN 1788.

Thalassoeca » REICHENBACH 1852.

♀ off the coast of South Georgia the 11 of August 1905. »Iris brown».

This bird is not recorded for the fauna of South Georgia by the German Expedition 1882—83, nor by the Swedish Expedition 1902. The same day as the specimen recorded above was shot, several more specimens of the same kind was seen about 6 english miles off the coast, but none was seen entering Cumberland Bay. It does not seem probable that it breeds on South Georgia.

The specimen collected by SÖRLING had some beaks of cephalopods in its stomach.

Priocella glacialisoides (SMITH) 1840.

- Syn.: *Fulmarus antarcticus* STEPHENS 1826 (nec GMELIN).
Procellaria tenuirostris AUDUBON 1839 (nec TEMMINCK).
 » *glacialisoides* SMITH 1840.
Priocella garnoti HOMBRON & JAQUINOT 1844.
Thalassoeca glacialisoides BONAPARTE 1855.

(♀ (skin) off the coast of Brazil the 22d of Oct. 1904. »Iris dark brown.»)
 (» (skeleton) » » » » » » » »)

K. A. ANDERSSON (♂) mentions this bird among those observed by him at South Georgia 1902, but it is not recorded by the German expedition 1882—83. It was seen by SÖRLING several times off the coast and once in Cumberland Bay. In the middle of Sept. a specimen was shot in Boiler Harbour, but lost among the drifting ice. It is not probable that it breeds on South Georgia as it was mostly, observed during the winter.

K. A. ANDERSSON (♂) found it breeding on the high and inaccessible rocks of Cape Roquemaurel, Louis Philippe land, and he has described its breeding habits.

Oceanites oceanicus (KUHLE) 1820.

- Syn.: *Procellaria oceanica* KUHLE 1820.
 » *wilsoni* BONAPARTE 1823.
Oceanites » KEYSERLING & BLASIUS 1840.

2 ♂♂ Boiler Harbour, Cumberland Bay, 14th of Dec. 1904. »Iris dark brown.»
 2 (skeletons) the same locality, the 13th of Febr. 1905.

There is a remarkable difference in size between these two individuals as the length of the wing is in one 146 mm, in the other only 138 mm. The measurement recorded by SALVIN in Cat. Birds B. M. (Vol. XXV p. 360) is a good deal larger than this, viz. 6,1 i., or about 155 mm. A specimen in this museum labeled »Atlantic Ocean» has the length of wing 152 mm. and another, from »lat. 19 Atl. Oc.», 149 mm. It is thus evident that a great variation takes place, and it might be that the birds inhabiting South Georgia are constantly smaller than those of other localities, although a greater material is needed to prove this, and all intermediate stages of length of wing from 138 to 155 seem to be found.

This Storm-petrel was not observed at South Georgia by the German Expedition 1882—83 (I). The Swedish Antarctic Expedition 1902 observed specimens of this kind at South Georgia, but the only place where its nest was observed was in Bay of Hope, Louis Philippe land.

Mr. SÖRLING saw great numbers of this Storm-petrel at South Georgia practically every day during the summer. In the end of March they disappeared and

had not returned in the beginning of October when SÖRLING left the island. This agrees very well with the observations of the Scottish Expedition (21) according to which it appeared on the South Orkney Islands the 11th or 12th of Nov. and the last disappeared the 23 of March.

To Cumberland Bay they were probably attracted by the refuse from the whale-factory. They did not attack pieces of blubber or such things, but collected the drops of oil and tiny pieces of refuse floating on the surface of the water.

The Great Skuas did not attack these Storm-petrels, if they were not shot, or disabled by shot.

SÖRLING did not find any nests of this species, but the males shot the 14th of Dec. had symmetrical bare patches on either side of the lower surface evidently from incubating. This proves that this Storm-petrel breeds on South Georgia, and that the male sits on the egg as well.

Its area of distribution is very wide and it probably breeds in suitable localities all over the sub-antarctic and antarctic regions as its burrow has been found on Louis Philippe Land, South Georgia, South Orkney Islands (21), Kerguelen (13 etc.), South Victoria Land (6, 14), Mount Gauss, Kaiser Wilhelm II Land (16) etc.

Garrodia nereis (GOULD) 1840.

Syn.: *Thalassidroma nereis* GOULD 1840.

Garrodia » FORBES 1881.

1 ♂ Moraine-Fiord, Cumberland Bay, 27th of November 1904. »Iris brown.»
Length of wing 130 mm.

Mr. SÖRLING saw this bird fly up from a tussock hill and shot it, but failed to find the nest, although he was convinced that it really was there. The correctness of this conviction was afterwards proved when it was found that the bird had a bare space on the belly from incubation. There is, however, another a distinct proof that this Storm-petrel breeds on South Georgia as SÖRLING found at Boiler Harbour the dried up remains of a not yet fullgrown young of this species which had the quills only $\frac{3}{4}$ developed. This happened at the end of Nov. 1904, so that this young was from the previous breeding season.

The German Expedition 1882–83 (1) found it also breeding in South Georgia. In the neighbourhood of Cumberland Bay it must have been rare as SÖRLING did not find any more specimens than those mentioned above. This Storm-petrel as well has an extensive breeding range as its eggs have been found so far from South Georgia as on Kerguelen Land (16) and the Chatham Islands.

***Fregatta melanogaster* (GOULD) 1844.**Syn.: *Thalassidroma melanogaster* GOULD 1844.» *tropica* GOULD 1844.*Fregatta melanogaster* BONAPARTE 1856.*Cymodroma melanogaster* RIDGWAY 1887.

PAGENSTECHEK (1) recorded this Storm-petrel as breeding on South Georgia on the basis of the collections of the German Expedition 1882—83.

Mr. SÖRLING did not observe or collect any specimens of this kind in Cumberland Bay nor anywhere else. It might, however, be possible that this Storm-petrel breeds in Royal Bay where it was recorded as found by the German Expedition, and where VON DEN STEINEN (12) also found an egg, said to belong to it, under a rock.

It has been doubted (6) whether the Storm-petrel, regarded by PAGENSTECHEK, (1) and VON DEN STEINEN (12) as belonging to this species, really had been correctly named and to make sure about this I wrote to Director KRAEPELIN and asked for information. His kind reply contained, however, a corroboration as he wrote that the specimen in the Hamburg Museum of Natural History »ist in der Tat *Cymodroma melanogastra* (nach den Proportionen der Phalangen und der Färbung) und nicht *Oceanites oceanicus*».

The Scottish Expedition found it breeding on the South Orkney Islands (21).

Eudyptes chrysolophus* BRANDT and*E. »diadematus GOULD»**

have been reported by the German Expedition in single straying individuals [PAGENSTECHEK (1)].

VON DEN STEINEN (12) writes about a third kind that should have been caught and kept alive for some time but finally escaped. It should have been very small »höchstens 30 Centimeter» (12). As no representative of this genus is by far so small this is very mysterious. It might be guessed at *E. chrysocome*, but this is very much bigger than the measurement recorded by the author quoted.

On the way back from South Georgia SÖRLING saw a crested penguin which appeared to him to be a specimen of *E. chrysocome*. This was in the open sea far from the island. In the immediate neighbourhood of South Georgia no crested penguin was ever seen and the crew of the whaling steamer never reported that they had seen any on their whaling trips.

Pygoscelis antarctica (FORSTER) 1781.Syn.: *Aptenodytes antarctica* FORSTER 1781.*Spheniscus antarcticus* STEPHENS 1825.*Pygoscelis antarctica* GRAY 1844.*Eudyptes* » » 1846.

♀ Boiler Harbour, Cumberland Bay, the 22th of Febr. 1905. »Iris greyish yellow.»
 ♂ (skeleton) Moraine Fjord, Cumberland Bay, the 26th of Febr. 1905.

The German Expedition 1882—83 VON DEN STEINEN (12) found this penguin breeding at Royal Bay, but only a few pair which had almost fullgrown youngs about the 18th of Febr. The Swedish Expedition did not observe it during its short visit at South Georgia 1902. The two specimens mentioned above were the only ones observed by SÖRLING. They were not in company and appeared to be somewhat more shy than the *papua*-penguins and were thus probably straying individuals. The whalers told several times that »black-billed penguins» were seen off the coast among the whales, and these were no doubt representatives of this species. It may therefore be possible that *P. antarctica* in small numbers breeds in other fjords of South Georgia, although SÖRLING did not observe any rookeries in the places visited by him. South Georgia is, however, to be regarded as lying at the northern boundary of the distribution of *P. antarctica*. On the South Shetland Islands and on the northwestern coast of Graham Land the Swedish Expedition 1901—1903 found it to be common and breeding in great rookeries at several places (8), but never on the eastern coast of Graham Land. This is the more remarkable as the latest news, which have reached us, tell that the Scottish Expedition 1903 found the Ringed Penguin superabundant on the South Orkney Islands (W. EAGLE CLARKE 21), where it was, next to *Pygoscelis adeliae*, the most numerous species of birds. On Saddle Island a single rookery was »believed to be tenanted by not less than 50,000 birds» and the Laurie Island was regarded to have a summer population of »not less than one million birds» (21) of this kind. The Ringed Penguin is said to be very pugnacious and a good fighter. Mr. EAGLE CLARKE (21) has written a highly interesting report about this bird based on the material from the Scottish Expedition so that its life-history is now just as well known as that of its congeners.

Pygoscelis papua (FORSTER) 1781.Syn.: *Aptenodytes papua* FORSTER, 1781.*Pygoscelis* » GRAY, 1846.*Eudyptes* »*Aptenodytes taniata* PEALE, 1848.*Pygoscelis wagleri* SCLATER, 1860.♂, ♀, ♀, Moraine Fjord, Cumberland Bay the 6th of May 1905. »Iris light brown.»
pull. Boiler Harbour, Cumberland Bay, the 7th of Dec. 1904.

♂, ♀, Moraine Fjord, Cumberland Bay, the 6th of May 1905

3 eggs the same locality the 21th and 24th of Nov. 1904. — And embryological material.

This species is the most common penguin on South Georgia, and SÖRLING found more or less numerous colonies in all the fjords he visited. A rookery at the Moraine Fjord with about 200 members was mostly studied by him. When he arrived the 20th of Nov. 1904 all eggs were laid and the birds sitting. The different nests were usually in a short distance from each other, »hardly 1 m». They consisted of earth, sand, moss and grass (Pl. XII fig. 51). Each nest contained, as a rule, 2 eggs, but some only one.

The birds defended their eggs boldly, as well with bill as with wings and both left blue marks on the arms and legs of the robber. When SÖRLING tried to steal an egg from behind, the bird turned round very quickly ready to defence again. When that did not help, but the egg nevertheless was taken away, the deprived mother walked resolutely to the next neighbours nest and stole an egg from it, in spite of the loud protests of the rightful owner. But so peaceful are the members of a rookery of this species inter se, that they never fight each other, as also K. A. ANDERSSON (8) has remarked. Not even to prevent such an openly committed crime as the theft of an egg by a neighbour, they will break the peace, although as already mentioned they know to strongly defend themselves against foreign intruders.¹ The thief put the egg out of the owners nest by means of her bill and then rolled it on the ground to her own.

At another opportunity, when SÖRLING only took one egg, the hen-bird remained quietly sitting on the other, and it does not appear to be a regular habit of the deprived birds to make up for their own loss by stealing from their neighbours, although it happened often enough.

Another day SÖRLING took an egg of the Great Skua and put it in the nest of a penguin which had only one egg. The penguin did not mind that in the least

¹ EAGLE CLARKE (21) reports the opposite from the experience from the Scottish Expedition on the South Orkney Islands: »The birds are somewhat timid; a few of those incubating were bold enough to peck at human intruders, but the majority ran off their nests when approached. — — — — They, however, fought fiercely among themselves, using both wings and bills, giving some hard smacks and sharp bites.» Such differences in habits in different localities are very peculiar

but sat down quietly on both the strange and its own egg. A few days later, however, the Skua-egg had disappeared.

When the eggs were hatched, each bird sat in the nest with its two young in front.

When the youngs were older they ran from their nest and huddled together in a great crowd when disturbed. SÖRLING made then an experiment to find out whether the youngs knew which was their own nest. For that purpose he suddenly caught one of the two grown up youngs in a nest, marked the nest and tied a string round one of the wings of the young penguin. When this was done he carried off the young and put it among the crowd of youngs at some distance from the nest. Then he retired and hid among the tussock-grass to watch the result. When all was quiet again, the youngs began to try to find their home-nest again. The marked young as well walked slowly in search of its nest, but evidently did not know where it was. It walked up to one nest after the other believing it was its own and looking for protection, but it was pecked at and driven away by the old penguins. Finally, since it had strolled in many different directions and tried to be sheltered by a lot of different birds, it found its own nest and then it was received and allowed to step in the nest.

Several times SÖRLING changed the youngs of different nests, but the parental birds changed back their own youngs again in such a passive manner that the wrong youngs were driven away and the right accepted, without the mother bird making any efforts to find her offspring.

The rookery was situated about 500 m. from the sea-shore and to and from the sea the penguins had a certain path. This went through the high tussock-grass and between the tussock-hills the ground was trod down and smooth.

On land the penguins have no other foes than the Great Skua which always is on the look out to steal eggs.

When SÖRLING arrived to South Georgia the nests were already built and the birds sitting. He observed, however, that male birds came carrying moss and other building-material to the nest which they put down at the margin of the nest. The sitting hen-bird then took it and arranged it as she wanted to have it. VON DEN STEINEN (12) has also observed that both sexes partake in constructing the nest.

The eggs of *Pygoscelis papua* are almost spherical the diameters of the three eggs recorded above being resp. 69×58 ; 66×55 ; 65×57 mm.

K. A. ANDERSSON (8) has given a full report about the moulting of the youngs of this and the other species of the genus. The young caught the 7th of Dec. 1904 by SÖRLING is light hoary grey on the back still more whitish beneath, only the upper surface and sides of head being dark slaty grey.

Aptenodytes patachonica FORSTER 1781.

Syn.: *Aptenodytes pennanti* GRAY 1844.

♂ Boiler Harbour, Cumberland Bay, the 19th of Nov. 1904. »Iris light brown.»
♂, ♀ Antarctic Bay, the 28 of June 1905. »Iris light brown.»

- 2 pull. the same locality and date. »Iris greyish brown.»
 2 pull (♂, ♀) the same locality, the 11th of March 1905.
 ♀ (skeleton) Boiler Harbour, Cumberland Bay the 12th of Jan. 1905.
 4 eggs, Antarctic Bay, the 11th of March 1905.

The King Penguin (Pl. XII fig. 47 & 48) is not only a very stately bird but also a very interesting bird from a biological point of view. To begin with, its breeding habits appear to be singularly irregular. The German Expedition 1882—83 found one or perhaps two rookeries of King Penguins near Royal Bay (12). The Swedish Expedition 1902 did not observe any birds of this kind at South Georgia (8). Neither Cumberland¹ nor Royal Bay appeared to be inhabited by King Penguins 1904—1905. But when Captain C. A. LARSEN the 10th of March ran into Antarctic Bay to seek shelter for his whaling steamer against a gale, he had the pleasure of discovering a rookery there. The following day, when he went ashore on the northern side of the bay, he observed some »kings» and further investigations proved that they were members of a rookery occupied by about 25 pairs of breeding birds. Some of these breeders had already young of a considerable size measuring more than half a meter in height, while others had eggs. Captain LARSEN took ten of these eggs and when they should be cleaned it appeared that some were rather strongly incubated, while others were freshly laid. And Captain LARSEN even believed that some of the penguins had not yet laid their egg. This is the more interesting as the middle of March is about the end of the antarctic summer, but the way in which the incubation takes place, and the woolly downy coat of the young explain the possibility of such irregular habits, in spite of the severe climate.

When the specimens which had eggs, were disturbed, Captain LARSEN saw that they carried away their eggs holding them between their legs, and the loose skin of the belly which forms a kind of a »pouch» in such a way as has first been described by WEDDELL, and then confirmed by others. When the egg was taken away, Captain LARSEN saw the penguins take stones and carry with them as a substitute for the lost eggs.² Each King Penguin had only one egg, and as the egg is carried hither and thither, it is evident that no nest is needed. The egg lay therefore without bedding on the bare stony ground when it was not held on top of the feet in the »pouch».

The 28th of June 1905 SÖRLING visited the same colony which was located about 250 m. from the sea-shore. The number of penguins had then decreased very much, and there were only four young. Most of the adults were females. SÖRLING observed, namely, that the sexes could be easily distinguished on the colour of the bill, which in the males was bright yellowish red, but in the females dull yellow. The remaining young were still in down and had consequently not yet been in the water, but were fed by the parental birds with fish. They had, however, attained

¹ The one recorded above as caught in Cumberland Bay was a straying individual.

² The »Emperor Penguin» is also told to have »an overpowering desire to sit on something» so that a great number of eggs, and even young are destroyed by the eagerness of the parents to nurse [E. A. WILSON (14)].

a very large size. The measurements of the largest of these young indicate that the actual length of body and neck is more than 85 percent of the same of the adult female, but in consequence of the thick and woolly down they looked even larger, SÖRLING says. The woolly coat is very well needed as it must be remembered that these young had to stand the severity of the antarctic winter with its fierce storms, which make the coldness still more penetrating.

The colour of the young is uniformly greyish brown. In the fall, in the middle of Sept. SÖRLING saw two young, caught by the sailors in Fortuna Bay, a small bay W. of Antarctic Bay. These young were somewhat redder than the others, »almost chocolate brown», SÖRLING says, »and somewhat streaked with yellow».

The only feathers that are developed in the preserved specimens are the tail-feathers, which begin to appear through the downy coat already in a young measuring about 40 cm. tot. l., and have attained a length of 9 cm. in the largest of SÖRLING's specimens.

On the young seen in Sept., according to SÖRLING, the »flippers» began to be free from down, but otherwise they were very woolly, still more so even than the smaller ones.

The eggs are singularly different in shape. Three of them may, however, be termed pyriform with the small end more or less pointed. The fourth is much more elongate, almost fusiform. The length of this egg is 117 mm. and its transverse diameter is 71 mm. The most narrow-pointed of the pyriform eggs has the diameters 110×77 , the others resp. 105×57 , and 98×73 mm. The difference in size is thus considerable, too. The shell is very coarse with a, partly quite rough coat of calcareous matter. The eggs have a light greenish tint.

Near the colony of King Penguins in Antarctic Bay there was a larger colony of about 200 *papua*-Penguins, but both species kept for themselves without mixing with the other species.

VON DEN STEINEN (12) tells that he tried to raise three young King-Penguins. They became very tame but finally died one after the other, because the food was not suitable.

Fishes.

The first knowledge about the fish-fauna of South Georgia was obtained by the German Expedition 1882—83. The material brought to Europe this way was worked out by FISCHER (2) who had the opportunity to state that, with the exception of two well known and circumpolar Nototheniids viz. *Notothenia coriiceps* RICHARDSON and *Harpagifer bispinis* RICHARDSON, all the remaining were, more or less completely, new to the science. FISCHER (2) thus described 6 new species, two of which were types of new genera. These were the following Nototheniids *Chænichthys georgianus* (later called *Parachænichthys georgianus*), *Notothenia marmorata*, *N. angustifrons*, (= *N. marionensis* GÜNTHER subsp. ?), and further *Sclerocottus* (n. g.) *schraderi*, *Gymnelichtys* (n. g.) *antarcticus* and *Liparis steineni*.

Through the investigations of the Swedish Expedition 1902 very important additions were made to the South Georgian ichthys (10). FISCHER's new Nototheniids were refound, but not his other new species. Instead of them, not less than 10 species were added to the list of South Georgia fishes. Out of those the following are to be regarded as geographic varieties of species found in other localities before, *Trematomus hansonii georgianus*, *T. bernacchii vicarius*, *Notothenia mizops nudifrons* and *Muraenolepis marmoratus microps*. The remaining six were described by the present author (10) as entirely new and included the type of a very interesting new genus (*Artedidraco*). They were all of them Nototheniids except one (the last in the following list), and they were named *Notothenia dubia*, *N. larseni*, *N. gibberifrons*, *Champocephalus gunnari*, *Artedidraco mirus*, and *Careproctus georgianus*.

Through SÖRLING's collection a new species of *Chænichthys*, described below, is added to the litoral fauna of South Georgia which thus counts 19 known members, 10 of which are endemic.

Two pelagic species collected by SÖRLING off the coast may not be regarded as strictly South Georgian.

The additions do not alter, but strengthen the opinion about the ichthys of South Georgia expressed by the present author in a paper (10) printed last year from which may be quoted the following passage: »These facts — — — — prove that, if the circumpolar and widely distributed fishes which are found as well in the

Magellan territory as at Kerguelen Land are not counted, the ichthys of South Georgia has more affinities with the much more distant eastern districts, Marion Island and Kerguelen Land (one species in common with either) than with the nearer situated western districts, Falklands and Tierra del Fuego (no species in common). But with the true Antarctic region the relationship is closest (four species in common). The latter fact is still more confirmed by the fact that the just discovered genus *Artedidraco* has one species at South Georgia, the other in the true Antarctic.»

The corroboration of this view with regard to the affinity between the fish-fauna of South Georgia and Kerguelen Land lies now in the fact that SÖRLING from South Georgia has carried home a member of the genus *Chaenichthys* s. str. which genus hitherto was known from Kerguelen Land alone.

DOLLO (7) has said concerning the *Nototheniidae* of South Georgia that they »représentent un appauvrissement et une specialisation des *Nototheniidae* Magellaniques.» But this opinion was expressed before the Swedish Expedition 1902 had increased the knowledge (10) about this fauna and it does not hold good any longer. DOLLO (7) enumerates for the Magellan territory 13 species of *Nototheniidae* belonging to 6 genera, but up to the present time not less than 14 members of this family belonging to 7 genera have been recorded from South Georgia. Probably all species of the litoral fish-fauna of South Georgia are not discovered yet, but it might be expected that several others may be found if thorough investigations are made for that purpose.

SÖRLING's time was so greatly taken up by preparing skeletons and skins of various vertebrates that he could not give much time to collecting fishes. He has, nevertheless, brought with him several specimens about which will be reported in the following lines.

***Notothenia mizops nudifrons* LÖNNBERG 1905.**

1 specimen among algae, Boiler Harbour, Cumberland Bay.

This is a common fish at the coast of South Georgia. The Swedish Expedition collected numerous specimens at different localities at South Georgia (10) as well as in the Antarctic region. The chief difference from *N. mizops* GÜNTHER from Kerguelen land, lies in the absence of scales in the interorbital region and crown of the South Georgian fish. Hence its subspecific name.

Notothenia marionensis GÜNTHER 1880.*(N. angustifrons FISCHER 1885.)*

A small specimen from Boiler Harbour, Cumberland Bay, »taken out of the stomach of a fish» caught in this locality.

4 specimens from the same locality, caught in a depth of $\frac{1}{2}$ — $\frac{3}{4}$ m. the 16th of April 1905. The temperature of the water + 1° C.

This species lived among the algæ on the bottom, SÖRLING says, but they were also often found lying openly on the clayey bottom, inside the kelp. Compared with the following sluggish species, they were very quick and difficult to catch, even with implements. They were coloured like the bottom, except for the dark bars, which made them conspicuous when they moved. Otherwise they were difficult to see.

Notothenia gibberifrons LÖNNBERG 1905.

1 large male specimen caught in a depth of 3—4 fathoms, Boiler Harbour, Cumberland Bay, January 1905.

This very easily recognizable species, which so well deserves its name, derived from the hump in front of the eyes, appears to be quite a common fish at South Georgia. The Swedish Expedition 1902 (10) had several specimens, but none so large as this which measures 460 mm. in tot. length, or 402 mm. without caudal fin. It is therefore of interest to compare the relative dimensions of this specimen with those of the smaller ones recorded before by the present writer (10).

	%
Length of head in % of tot. l. without caudal	31,0
Diameter of eye » » » » »	5,7
Length of snout » » » » »	9,5
Depth of caudal peduncle in % of tot. l. without caudal	6,2
Length of pectoral fin » » » » »	25,0
» » ventral » » » » »	16,1
Interorbital breadth in % of length of head	7,2

These percentages agree on the whole very well with those recorded before. The head is somewhat larger in this big specimen. The eye and the ventral fins have continued to decrease in size relatively, as also the measurements taken before indicated. The pectoral fins, which decreased with age in the former table of measurements, have increased again to the same size as in the young specimens and this is, no doubt, to interpret as a masculine characteristic.

The lower side of the head, and gill membranes are almost unpigmented otherwise the colour is as described before (10).

N. gibberifrons is a sluggish bottom fish. SÖRLING often saw it in shallow water in a depth of about 1 m. or a little more. It remained motionless, even if a small boat passed over it, and it could be touched with the oar before it moved. But it could be caught with »pilk», a tin-fish with hooks. It was, however, not so much estimated as food as the next species.

Notothenia macrocephala marmorata (FISCHER) 1885.

4 specimens caught in a depth of 3—4 fathoms in Boiler Harbour, Cumberland Bay Jan. 1905.

3 specimens from the same locality, caught in a depth of 6½ m., the 3 of Jan. 1905.

5 large specimens caught in the open sea about 40 kilometres of Cumberland Bay, the 22d of March 1905.

Several small, more or less mutilated specimens taken out from birds and seals, one shot from the bill of a tern.

The largest specimen measured 710 mm. in total length, or about 630 mm. without caudal. As this and the other large specimens from the open sea surpass in size the largest specimens hitherto known, some relative measurements have been taken for the sake of comparison with those published before by the present author (10).

	♂	♀	♀
Total length without caudal	515	600	630
Length of head in % of tot. l. without caudal	29,5	28,6	27,7
Interorbital width » » » » »	9,7	9,1	9,3
Length of mandible » » » » »	15,1	14,1	14,4
» » maxillary » » » » »	12,8	12,6	12,7
Distance from snout to first dorsal in % of tot. l. without caudal	30,6	28,1	27,7
Distance from snout to anal fin in % of tot. l. without caudal	55,1	57,8	53,9
Length of ventral in % of tot. l. without caudal	13,5	14,3	13,3
Depth of caudal peduncle » » » » »	7,3	6,6	6,5
Diameter of eye in % » » » » »	4,6	4,0	3,8.

From this is apparent that the relative measurements expressing the length of the ventrals, the depth of the caudal peduncle and the diameter of the eye continually decrease with age.

The relative measurements expressing the length of the head, of the mandible and the maxillary are not quite so large as those derived from the largest specimen of the former collection (10) but agree better with those of the middle sized specimens from 1902. This may no doubt find an explanation in the fact that the largest specimen from the collection of 1902 had been badly bitten in the back so that part of the dorsal etc. had been cut away. This wound had healed, but probably this had kept back the growth of the fish to some extent, so that the head had grown comparatively more than the body.

The large females caught in the later part of March had the ovaries swelled to some extent, and the diameter of the eggs, in a preserved state, varied in different specimens between 2¼, and nearly 3 mm. This appears to indicate that the spawning season could not be much remote. The smaller specimens caught in May 1902, »showed genital organs beginning to develop» (10). Perhaps these were not yet mature, or it may be that the young specimens do not spawn at the same time of the year as the large ones.

The large specimens caught in the open sea, lived near the surface so that they easily could be seen swimming hither and thither. They preyed here on »kril» (Euphausiids) and fish. Among the remains of fish found in the stomachs of this species specimens, of *Myctophum antarcticum*, *Champsocephalus gunnari* and *Benthodesmus* sp. may be recognized.

Even the large specimens of this collection were marmorated, except one which was an albinistic variety without any pigment.

N. m. marmorata is no doubt the most common fish at South Georgia, or at least the one mostly seen. The fishes taken out of the stomachs of birds, or from the bill of terns etc. were usually small specimens of this kind. When fishing was done in the Bay for the purpose of obtaining fish for the table, *N. m. marmorata* was most commonly caught and also most liked. As fishing gear the »pilk» and hand line was used, but SÖRLING says that a better result was obtained if some kind of bait was added to the tin-fish of the pilk. As bait were used pieces of fish, or pieces of meat of penguins etc., but SÖRLING thinks that the very best thing for bait was the heart or some other part of a teal. Out on the open sea »on the bank» the large specimens of *N. m. marmorata* were extremely abundant. During pauses in the whale hunt, as, for instance, when a whale had been killed and should be hauled in and secured to the steamer, it was a much enjoyed sport to fish *N. m. marmorata*, SÖRLING says. The empty life-boats of the whaling steamer were then, as a rule, used for storing the fish. Two men each with a pilk could sometimes in less time than an hour fill both lifeboats to the brim with fish. Often two fishes were caught at one time, one on either of the hooks of the »pilk». The fish was eaten as well fresh as salted, and regarded as very good. A good many barrels of cleaned, split and salted fish of this kind, and caught as described above, was sent to Buenos Aires for sale and there found a ready market. There is thus no doubt that important fisheries could be established at and off the coast of South Georgia.

Notothenia macroc. marmorata was often infested with parasitic crustacea on its gills.

Parachænichthys georgianus (FISCHER) 1885.

2 specimens in a depth of 22 m. Boiler Harbour, Cumberland Bay.

1 specimen caught in a depth of 3—4 fathoms Boiler Harbour, Cumberland Bay in Dec. 1904, temperature of the water + 8,5° C.

The longest of these specimens measured about 53 cm. and the others had almost the same size. All of them were males. All three were also rather densely dotted on the back and sides with small round spots. In one specimen the paired fins and the lower surface of the head and body appear to have been brick red in life, and the same colour has been present on the anal and caudal fins in a lesser degree.

These fishes live at the bottom and were caught with »pilk». When brought up in the air they died very soon, stifled in consequence of their very large gill-openings, and then opened their mouths wide open. But although the fish is dead, the muscles retain vitality for a long time so that, even when the fish is cut to pieces, contractions of the muscles may be observed, SÖRLING says. Probably in consequence of this and of its ugly look, this fish was less estimated as food although it did not taste bad, according to SÖRLING's opinion.

Parachænichthys georgianus was often infested by leeches.

Champscephalus gunnari LÖNNBERG 1905.

2 specimens caught about 90 kilometres off Cumberland Bay, in the open sea, about 6 fathoms from the surface the 1st of March 1905.

4 specimens caught about 50 kilometres off Bay of Isles, in the open sea the 20th of April 1905.

The last 4 specimens are the largest, measuring about 40—44 cm. As several of the specimens collected by the Swedish Expedition 1902 (10) were of the same size this may be regarded as the average size of the adult fish of this species. The two others which are about 10—12 cm. shorter, correspond also in size with some of the specimens from 1902 (10) and may be regarded to be a year younger.

The new experience received about this fish, teaches us that it leads at least partly a pelagic life off the coast. The stomachs of the specimens collected by SÖRLING were filled with remains of shrimp-like crustaceans (perhaps large Euphausiids).

The specimens caught in April were 3 males and one female. Two of the former had the testicles not much developed, but in a stage indicating beginning growth. In the third the development had gone further, perhaps between a third and a half of the full growth. In the female the ovaries were somewhat swelled, and the eggs measured in a preserved state about $1\frac{2}{3}$ mm. in diameter. If these facts are compared with those recorded before (10) according to which the eggs of this fish in the later part of May were found to have a diameter between 3 and 4 mm., it seems as if the development of the genital organs should be rather rapid at this time of the year, and thus the spawning take place at the end of May or beginning of June. The present writer has before (10) expressed the probability of the eggs of *Ch. gunnari* being demersal.

This species is probably so common that it might become of economic value, but as it lived a little deeper below the surface, it was not so much observed as *Notothenia macroc. marmorata*, and consequently not the object of any fishing in a great scale.

Chænichthys aceratus n. sp.

1 specimen caught in a depth of 3—4 fathoms, Boiler Harbour, Cumberland Bay in Dec. 1904, temperature of the water + 8° C.¹

Dorsal: VII, 37; Anal: 36; Pectoral: 25 (including a rudimentary upper ray).

Total length	522 mm.
» » without caudal	465 »
Depth of body at the beginning of first dorsal	91 »
Length of head (including opercular flap)	190 »
Præorbital length of head	92 »
Postorbital » » »	59 »
Interorbital width (osseous)	35 »
Distance from orbit to nostril	21 »
Longitudinal diameter of eye	32 »
Greatest breadth of snout on a level with nostrils	77 »
Distance from snout to first dorsal	190 »
» » » » anal fin	265 »
Length of pectoral	94 »
» » ventral	80 »
Depth of caudal peduncle	22 »
Length of mandible	127 »
» » maxillary	115 »

Body naked provided with two lateral lines, the lower confined to caudal peduncle. Head pickerel-shaped. Snout broadly rounded, spatulate, its greatest width at a level with nostrils contained about $2\frac{1}{3}$ times in a length of head. Head very large, its length with the opercular flap is contained about $2\frac{3}{4}$ times in total length including caudal, or constitutes 40,8 % of the total length without caudal. It is scaleless and covered by a soft skin. The length of the præorbital portion of the head is almost equal to half the length of the head. The longitudinal diameter of the eye is not contained quite fully 6 times, in the length of the head, and it is a little less than the interorbital width of osseous parts. The latter measurement is contained about $5\frac{1}{2}$ times in length of head. A large and wide tubular nostril $\frac{2}{3}$ of the diameter of eye in front of the orbit. The supraorbital margin rises posteriorly to a low ridge which ends on a level with the posterior margin of the eye. Behind the end of this ridge a low tubercle. Interorbital region concave and from the same two ridges extend forward bordering a broad furrow on the snout, which, however, not reaches to the end of the vomer which presents a slightly raised median ridge at the end of the furrow. There is no trace of a ›horn‹ on the snout (as in *Ch. rhinoceratus*). On the crown five low ridges radiate from a common centre, one median straight backwards, one transversal on either side in a lateral direction forming a right angle with the median one, and finally one obliquely backwards on either side dividing the angle between the median and the lateral ridges. The maxillary extends to below the posterior border of eye. The lower jaw is a little shorter than the upper. Broad bands of small pointed uniform teeth on both jaws.

¹ This was unusually high temperature, as product of a warm and sunny day, SÖRLING says, the usual temperature of the water was + 3,5° C.

Inside the teeth there is a velum in both jaws, but it is interrupted in front in the upper jaw.

Preoperculum unarmed. Operculum divided in three branches, one lower and two upper. The posterior upper branch is provided with 5 blunt and flat spines, three of which sit at the upper end, and the two remaining at the posterior and lower margin of the same branch. The latter are more knobs than spines.

Gillrakers almost wanting but on first and second arch a few short and blunt ones sit very far apart.

The first dorsal is much higher than the second, the third ray longest (80 mm.), second (75 mm.) and fourth (74 mm.) almost equal, then first (65 mm.), fifth (61 mm.), sixth (28 mm.) and seventh (18 mm.). The average length of the rays of the second dorsal is about 33 mm. The rays of the anal are from about 38 to 33 mm. The pectorals are large extending beyond the beginning of the anal fin. Its hindmargin is squarely truncate, although the posterior lower parts are rounded. The three longest rays of the ventrals enveloped in a very thick and swollen skin.

The upper lateral line extends nearly to the root of the tail. It is provided with, on one side about 113, on the other about 119 little shields. The lower lateral line is quite short and contains only about 10 little shields.

The body is somewhat arched from the nape. The anus is situated below the fourth ray of the second dorsal. The caudal peduncle is short so that the rays of the anal and second dorsal fins, when depressed, touch with their tips the caudal expansion.

This fish is, of course, nearly related to RICHARDSON'S *Chænichthys rhinoceratus*¹ from Kerguelen land, but differs through the absence of a »horn» on the snout, and in several other respects. The number of rays in second dorsal, and anal fins is greater and so is the case with the pectoral as well in the South Georgia species which has (about) three rays more. The jaws are equal in the fish of Kerguelen land but the lower jaw is somewhat shorter in this one. The number of small shields of the lateral line is much greater in this species, etc.

The colour of the *Chænichthys* of South Georgia is purplish brown on the back with four broad blackish transverse bands. The first across the first dorsal and base of pectorals, the second at the beginning, the third at the middle and the fourth at the end of the second dorsal. On the sides of the head a broad blackish band extends along the maxillary under the eye and across the gill-cover. The flanks appear to be leaden grey, lower side of head and belly yellowish white.

The related type species from Kerguelen land is said to have a similar ground colour »varied by numerous round, or oblong, anastomosing black spots». Its colour pattern is thus distinctly different.

Chænichthys aceratus as its relative from Kerguelen Land is a bottom fish living near the shore among the seaweeds.

¹ Ichthyology of the voyage of H. M. S. Erebus and Terror. London 1844—48.

In this connection I wish to make a correction and an addition to my paper (10) on the fishes of the Swedish Antarctic Expedition 1901—1903. On page 47 of the quoted paper (10) I have described a fish caught at Snow-Hill in a depth of 125 m. as a new subspecies of *Chaenichthys rhinocerotus* RICHARDSON and called it *hamatus*. I was compelled to do so by the great resemblance between RICHARDSON'S description and figure of *Chaenichthys rhinocerotus* on one side and the fish from Snow Hill on the other. When I now have subjected the latter to a renewed examination and had for comparison a true *Chaenichthys* (the one described above from South Georgia as *Ch. aceratus*), I have found that the discrepancies are greater than I thought at first. The relationship between the two is certainly very close. There is, however, a characteristic which I unfortunately overlooked when describing the fish from Snow-Hill which separates it so much from the typical *Chaenichthys* that, according to the definition of the genera of this family in common practice it seems necessary to create a new genus. This characteristic is the presence of a third lateral (ventral) line. The reason why this was not observed at the first examination lies in that it could not be so easily seen as the dorsal lateral line in consequence of the wrinkles of the thick skin of the preserved fish, and in addition to this, it was covered by coagulated mucus. When this latter had been removed it is, however, conspicuous enough. I propose to call this new genus with allusion to the locality where it was first found:

Chionodraco n. g.

And it may be described as nearly related and similar to *Chaenichthys*, thus head and body naked but the latter provided with a third ventral lateral line which extends from above the anus to a little beyond the posterior end of the anal fin but not to the base of the caudal fin. From *Cryodraco*¹ DOLLO 1900 which also has three lateral lines it is easily and completely distinct in not having the ventral fins prolonged nor the pectorals pointed, nor the first dorsal reduced, nor showing any other adaptations to a benthopelagic life. *Chionodraco* is evidently like *Chaenichthys* a bottom fish of the litoral region, although it, in consequence of its antarctic habitat, may live in a somewhat greater depth than the latter.

Gillopenings wide, gillmembrane in the middle attached to the isthmus. Branchiostegals 6. No enlarged teeth, on the jaws, no vomerine or palatine teeth. Only a very few rudimentary gillrakers near the bend of the arches. Opercle armed. A single tubular nostril in front of the eye.

The only hitherto known species is

Chionodraco hamatus (LÖNNBERG) 1905.

Dorsal VII; 37. Anal 33. Pectoral 23. Snout produced, spatulate. Head large contained about three times in total length with caudal included. Crown of head flat, interorbital region concave. Two ridges extend from there forward, bor-

¹ *Cryodraco* may be a specialisation to a benthopelagic life of a fish similar to *Chionodraco*.

dering a broad flat furrow, but disappear before arriving to the end of vomer on which sits a well developed »horn» (as in *Chænichthys rhinoceratus*). Upper rim of orbit raised to a low crenulated ridge. Diameter of eye contained not fully twice in length of snout, and $4\frac{1}{3}$ in length of head, opercular flap included. Interorbital width (osseous) about $1\frac{4}{7}$ times in length of snout. The præorbital part of head is longer than the postorbital but not fully equal to half the length of head. The upper posterior branch of the operculum armed with 5 spines the two uppermost directed upward, the three lower obliquely backward. At the angle of the opercle the interoperculum carries two short but stout spines forming a fork. Teeth on jaws in three series above and below.

First dorsal more than twice as high as second. The order of length of the rays of first dorsal is: 4, 3, 2 = 5, 1, 6, 7, but when the fin is erected in consequence of the direction of the rays the four foremost reach about to the same level. Anal rays a little shorter than those of second dorsal, their ends being enveloped in thick swollen skin. Pectorals resemble those of *Chænichthys*, truncate with the upper angle rounded and the lower portion much more rounded, they extend a little beyond the anus and equal in length the distance from end of snout to centre of eye. The ventrals do not reach anus; the three longest rays enveloped in their distal parts in a very thick and swollen skin so that the thickness amounts to about 8 mm.¹ Caudal peduncle short and moderately slender, about as high as long, its height contained about three times in the length of snout. Caudal fin short rounded, its length about equal to the interorbital width. Colour »bluish grey on the back and the sides», first dorsal appears to have been blackish and there is a large dark blotch below the eye. Lower side unpigmented.

Myctophum antarcticum (GÜNTHER).

Fully recognizable specimens of this fish were by SÖRLING taken out of the stomachs of *Notothenia macrocephala marmorata* caught off the coast of South Georgia.

Benthodesmus sp.?

In the stomach of the same kind of fish as the foregoing was found a head and anterior part of body of a fish which appears to belong to this genus.

¹ No doubt the ventrals are used as feet by the fish for walking on the ground.

List of the repeatedly quoted literature.

- 1) PAGENSTECHER: Die Vögel Süd-Georgiens, nach der Ausbeute der deutschen Polarstation in 1882 und 1883. Jahrb. d. wiss. Austalten Hamburg f. 1884. Hamburg 1885.
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Explanation of Plates.

Pl. I.

Fig. 1. Chick of *Chionis* Cumberland Bay. Painted by A. EKBLÖM.

Pl. II.

- Fig. 2. Head of *Nettion georgicum*, Cumberland Bay, after a colour-sketch made by E. SÖRLING on South Georgia, painted by A. EKBLÖM.
 Fig. 3. Bill seen from above of the same.
 Fig. 4. Head of *Phalacrocorax atriceps*, Cumberland Bay, after a colour-sketch made by E. SÖRLING on South Georgia, painted by A. EKBLÖM.
 Fig. 5. Bill seen from above of the same.

Pl. III.

- Fig. 6. Disturbed and roaring old Elephant-seals, in the season when they shed their hair. Cumberland Bay. (SÖRLING photo.)
 Fig. 7. Disturbed young Elephant-seals in the tussock-grass, Cumberland Bay. (SÖRLING photo.)
 Fig. 8. Young Elephant-seals sleeping on the beach. Several specimens of *Chionis*. Cumberland Bay. SÖRLING photo.)
 Fig. 9. Young Elephant-seals intending to go into the sea. A *Chionis*. The same locality. (SÖRLING photo.)
 Fig. 10. Young Elephant-seals which have just come ashore. The same locality. (SÖRLING photo.)
 Fig. 11. View of the beach with several specimens of *Chionis*. (SÖRLING photo.)

Pl. IV.

- Fig. 12. Copulating Elephant-seals. Cumberland Bay. (SÖRLING photo.)
 Fig. 13. Copulating Elephant-seals. The same locality. (SÖRLING photo.)
 Fig. 14. A bull of Elephant-seal with many scars. The same locality. (SÖRLING photo.)
 Fig. 15. Sleeping Elephant-seal (semiadult). The same locality. (SÖRLING photo.)
 Fig. 16. An old bull of Elephant-seal with the proboscis slackened in the act of expiration. (SÖRLING photo.)
 Fig. 17. A semiadult bull of Elephant-seal. (SÖRLING photo.)

Pl. V.

- Fig. 18. Southern Finback (*Balænoptera quoyii* FISCHER). (SÖRLING photo.)
 Fig. 19. Southern Blue whale (*Balænoptera intermedia* BURMEISTER). (SÖRLING photo.)
 Fig. 20. A Southern Black whale (*Balæna australis*) »blowing» off South Georgia. (Capt. LARSEN photo.)
 Fig. 21. Southern Finback (*Balænoptera quoyii* FISCHER). (SÖRLING photo.)
 Fig. 22. Southern Finback (*Balænoptera quoyii* FISCHER). (SÖRLING photo.)
 Fig. 23. Hind-end of a Southern Finback (*Balænoptera quoyii* FISCHER) part of the flukes are cut off. (SÖRLING photo.)

Pl. VI.

- Fig. 24. Southern Black whale (*Balæna australis* DESMOULINS). (SÖRLING photo.)
 Fig. 25. Southern atlantic Humpback (*Megaptera lalandii* FISCHER). (SÖRLING photo.)
 Fig. 26. Head of the same. (SÖRLING photo.)
 Fig. 27. Foetus of Humpback (*Megaptera lalandii* FISCHER). (SÖRLING photo.)
 Fig. 28. View of under parts of Southern atlantic Humpback (*Megaptera lalandii* FISCHER). (SÖRLING photo.)
 Fig. 29. Southern Black whale (*Balæna australis* DESMOULINS). (SÖRLING photo.)

Pl. VII.

- Fig. 30. Southern Black whale (*Balæna australis* DESMOULINS), head and anterior part of body. (SÖRLING photo.)
 Fig. 31. Full view of the same. (SÖRLING photo.)
 Fig. 32. Anterior part of a southern Black whale (*Balæna australis* DESMOULINS) to show the shape of the pectoral. (SÖRLING photo.)
 Fig. 33. View of the under parts of a variety of Southern Black whale (*Balæna australis* DESMOULINS). (SÖRLING photo.)
 Fig. 34. Front view of a southern Black whale (*Balæna australis* DESMOULINS) to show the tongue in the mouth. (SÖRLING photo.)
 Fig. 35. Anterior end of a foetus of southern Black whale (*Balæna australis* DESMOULINS). (SÖRLING photo.)

Pl. VIII.

- Fig. 36. A blade of baleen of *Balænoptera intermedia* BURMEISTER from South Georgia about $\frac{2}{100}$ nat. size.
 Fig. 37. A blade of baleen of *Balænoptera quoyii* FISCHER from South Georgia. $\frac{3}{20}$ nat. size.
 Fig. 38. A blade of baleen of *Megaptera lalandii* FISCHER from South Georgia. $\frac{3}{20}$ nat. size.
 Fig. 39. A blade of baleen of *Balæna australis* DESMOULINS from South Georgia. $\frac{1}{10}$ nat. size.

Pl. IX.

- Fig. 40. Foetus of *Megaptera lalandii* FISCHER. About $\frac{1}{3}$ nat. size. (A. EKBLOM del.)

Pl. X.

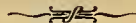
- Fig. 41. A piece of skin (preserved in alcohol) from the upper jaw of *Balæna australis* DESMOULINS, to show the arrangement of the hairs. A piece of the epiderm has peeled off. About $\frac{1}{7}$ nat. size.
 Fig. 42. A piece of skin of the lower jaw of the same, to show the arrangement of the hairs. About $\frac{2}{3}$ nat. size.
 Fig. 43. A section through a pathological structure among the baleen of *Balæna australis* DESMOULINS.
 Fig. 44. Vertical section through the »bonnet» of a southern Black whale (*Balæna australis* DESMOULINS). The section has been laid somewhat to the side of the median line. About $\frac{1}{2}$ nat. size.

Pl. XI.

- Fig. 45. A piece of the 'bonne' of the southern Black whale (*Balaena australis*) seen from above. $\frac{2}{5}$ nat. size.
Fig. 46. One of the maxillary excrescences from the same whale showing a lot of *Cyami* and some *Tubicinellæ*. $\frac{3}{4}$ nat. size.

Pl. XII.

- Fig. 47. A solitary King penguin (*Aptenodytes patagonica* FORSTER) in Cumberland Bay. (SÖRLING photo.)
Fig. 48. The same, front view. (SÖRLING photo.)
Fig. 49. A young of *Chionis* on the deck of the whaler, Cumberland Bay. (SÖRLING photo.)
Fig. 50. A Great Skua (*Catharacta antarctica* LESSON) in Cumberland Bay. (SÖRLING photo.)
Fig. 51. A *Papua*-rookery, Cumberland Bay. (SÖRLING photo.)
Fig. 52. A Great Skua (*Catharacta antarctica* LESSON) on its nest, Cumberland Bay. (SÖRLING photo.)



Tryckt den 18 juli 1906.







Fig. 6



Fig. 7



Fig. 8



Fig. 9



E. Sörling photo.

Fig. 10



Fig. 11

Ljustryck J. Cederquist Sthlm.



Fig. 12



Fig. 13



Fig. 14



Fig. 15



O. Sörling photo.

Fig. 16



Fig 17

Ljustryck J. Cederquist, Stilm



Fig. 18



Fig. 19



Fig. 20



Fig. 21



Fig. 22



Fig. 23

Ljustryck J. Cederquist Sthlm

O Sörling photo.



Fig. 24



Fig. 25

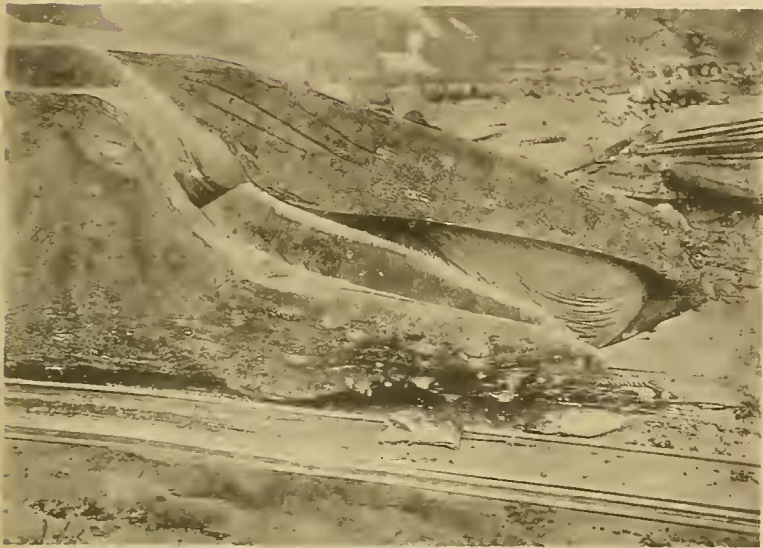


Fig. 26



Fig. 27



Fig. 28



Fig. 29 Ljustryck J. Cederquist, Sthlm.



Fig. 30



Fig. 31



Fig. 32



Fig. 33



Fig. 34

E. Sörling photo.



Fig. 35

Ljustryck J. Cederquist Sthlm.



Fig. 36



Fig. 37



Fig. 38

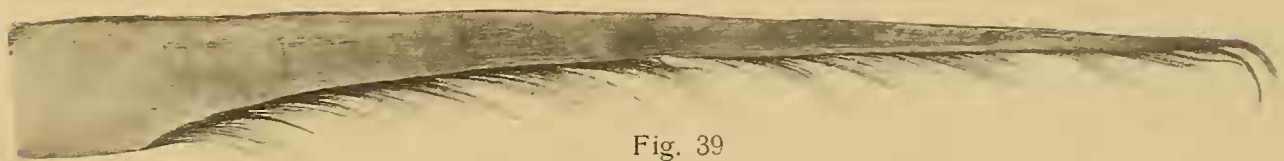


Fig. 39

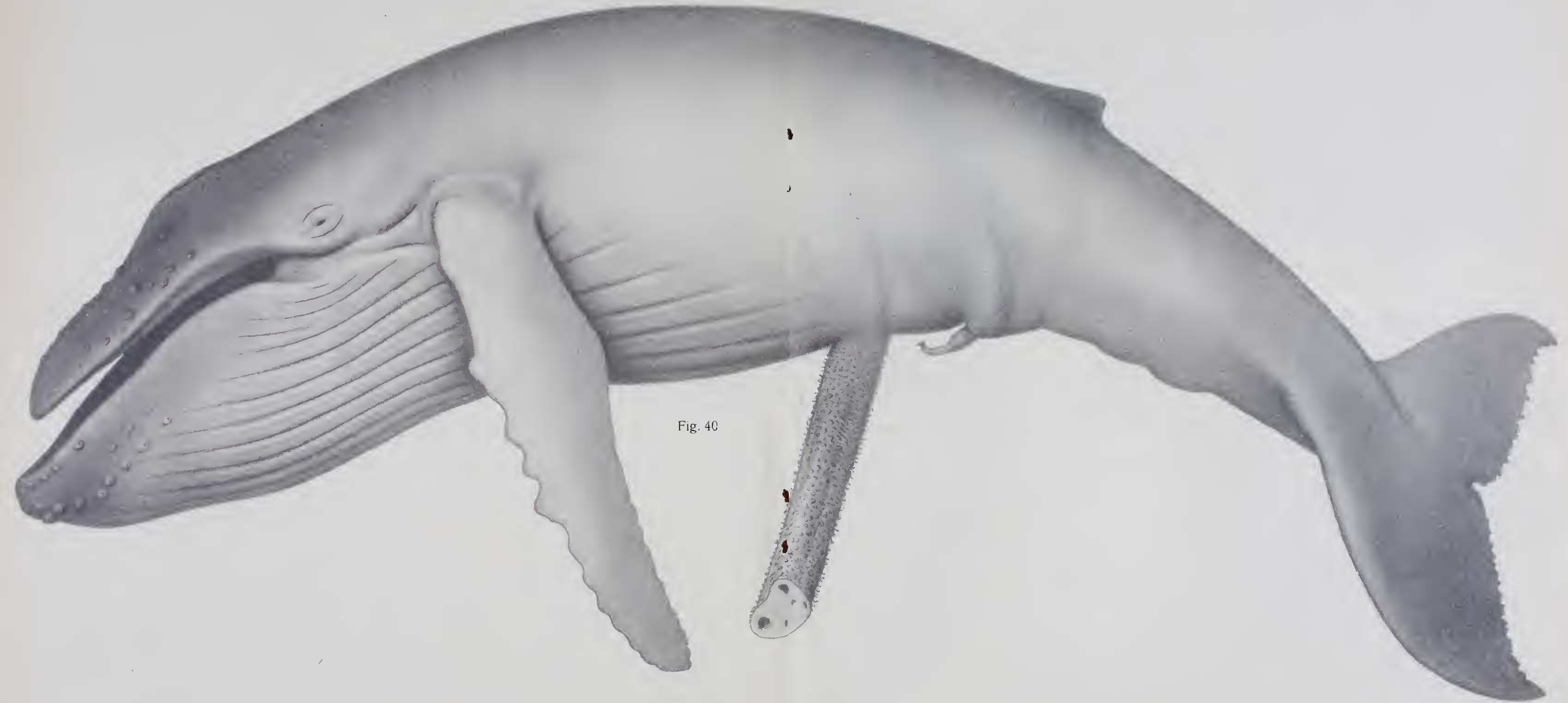


Fig. 40

A. Ekblom del.

Ljustryck Justus Cederquist. Sthlm.



Fig. 44



Fig. 41

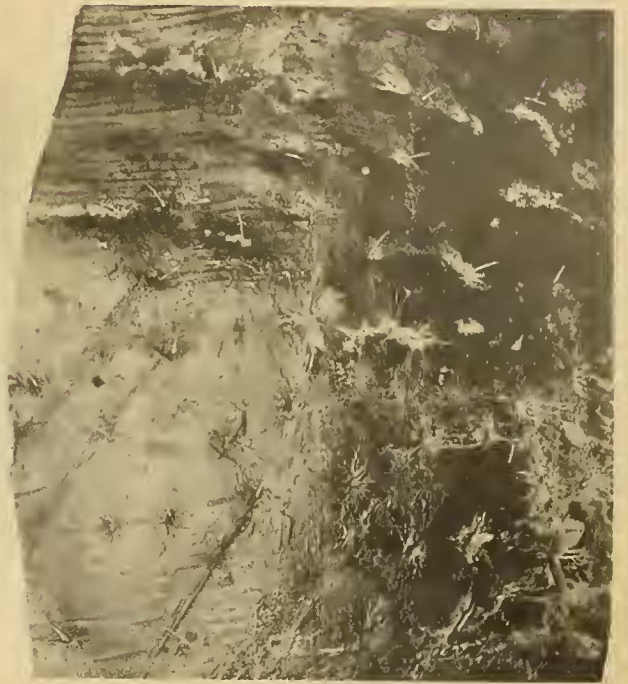


Fig. 42

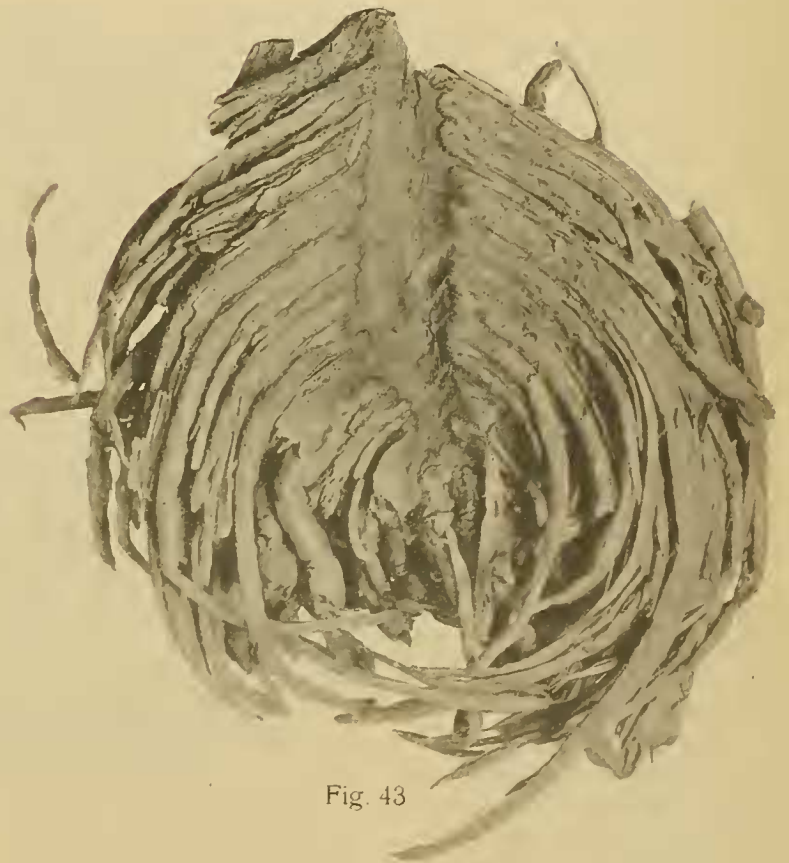


Fig. 43



Fig. 45



Fig. 46



Fig. 47



Fig. 48



Fig 49



Fig. 50



O. Sörling photo

Fig. 51



Fig. 52 Ljustr. J. Cederquist, Sthlm.